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How to Stake Claims in Ontario, by William G. Mick

Automatic Substation Control Assures Economical Operation, by Edgar Gealy

Methods Used on Comstock Lode for Lowering Sticky Ores, by Thomas C. Baker

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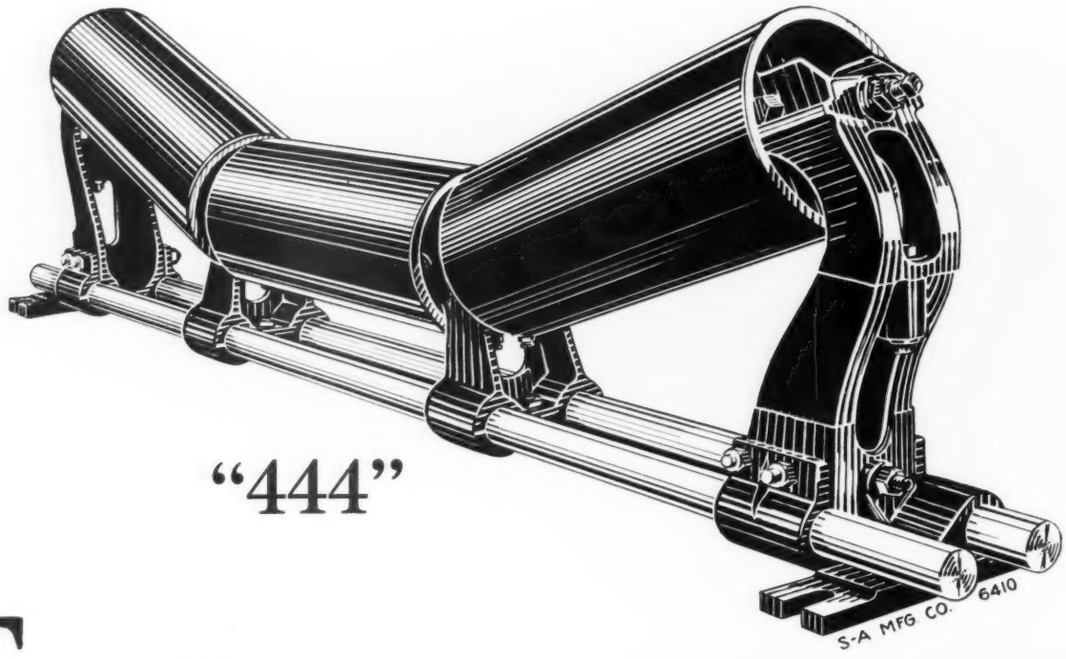

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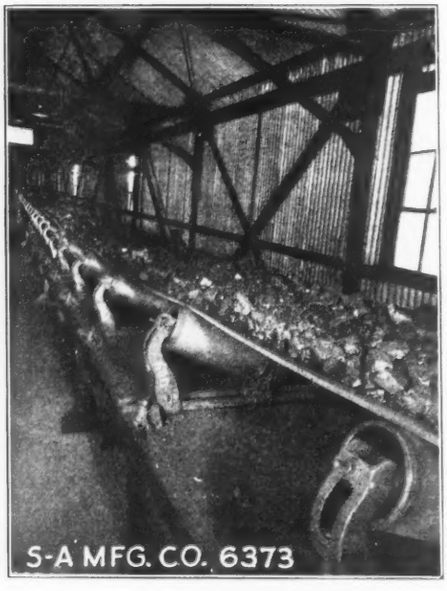

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Volume 123 June 25, 1927 *Number* 26

ENGINEERING AND
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ENGINEERING AND
MINING JOURNAL

Volume 123 New York, June 25, 1927 *Number* 26

High Production and Prosperity

A FUNDAMENTAL ECONOMIC TRUTH was emphasized by H. H. Rice at the recent convention of the United States Chamber of Commerce. Said Mr. Rice: "High wages are more a result of prosperity than prosperity is a result of high wages. Prosperity is a result of high average production per man, however that production may be achieved. This ability to produce more per worker is the result of increased brain power as evidenced in invention, equipment, management, and organization, and that is the chief answer to our prosperity and high wages."

It is self-evident that the more each individual produces—the more all the people of the country produce—the more there will be to distribute, and hence the better every one will be provided with worldly goods, which is another way of saying that every one will be more prosperous. The manual workers of the United States realize this much better than they did a few years ago. There was a time when the chief demand of the labor unions was for shorter hours as well as higher wages, often coupled with a limit to production, as for instance the edict that a bricklayer must not lay more than a specified number of bricks a day. We hear less of the shorter hour and less work argument now, and more of a demand for higher wages, which is as it should be. But a greater production per man comes not alone from working long hours—in fact, too long hours may defeat the desired end; it comes from education so that the work may be intelligently done, from organization and proper supervision, and from the use of machinery to do in one hour what formerly took several hours to accomplish by hand. In these three fields, the United States has been a leader.

Plenty of hard work hurts none of us, if it is intelligently conducted and produces results.

The President in the Black Hills

WHEN MR. COOLIDGE TIRES OF FISHING, he might prospect a little. The region of the Black Hills adjoining Harney Peak abounds in minerals and is famous for the many species that occur. There the Great Builder has used rare and curious substances in fashioning earth's structure, reminiscent of those adorning the New Jerusalem that is told of in the Book of Revelation. Beryl and tourmaline, rutile and microcline, silver and columbite, corundum and gold—these are but a few of the materials that the Master Mason has employed. Spinel and epidote, albite and spodumene, zircon and tantalite, bismuth and rose quartz—with these and fifty others the foundations of this paradise are built. Of these Mr. Coolidge may have his choice if he will but take his pick and look for them. What a superior paradise it is with its provision for angler, huntsman, and prospector—a heaven upon the earth! Let the President turn prospector.

Some experience as prospector would serve the President in good stead. Successful in it, he might be tempted further into mining. Eventually he would return to Washington with a livelier sympathy for the miner and his problems. The spectacle of dormant mineral reserves would lead him to a clearer understanding of the need for technical research. Perhaps in time, under the kindly influence of a well-informed executive, the Director of the Budget would be less ruthless with his ax.

Yes, let Mr. Coolidge turn prospector. It will give him health and pleasure and to the nation profit. Has he not an excellent example in the Duce, who recently became a farmer for a day?

Are Share Prices Too High?

EXCEPT FOR A BRIEF RECESSION early in 1926, the stock market has been advancing steadily for several years, until now the general level probably is higher than ever before. Some of the astute operators in Wall Street say that prices are too high; that something more than a temporary reaction must take place soon. Many have advanced the same contention for the last year, but the event has not supported their view as yet.

Prices for anything are made by the willingness of the public to pay them. It is true that speculative buying is stimulated by low interest rates for money. Interest is a factor in the "cost" of speculating; and if money is cheap the likelihood of ultimate profit from speculative market operations is enhanced. Likewise the general public, with its habitual optimism, is prone to buy on a rising market, and consequently it helps to keep the ball rolling up hill. No doubt the rapid rise of a few outstanding leaders creates a momentum for the entire market that carries along less deserving stocks, thereby elevating the average level. To some extent, at least, it is probable that prices are too high, from the standpoint of underlying value.

However, there are sound economic reasons for many of the advances, and the public uses more discrimination than sometimes is credited to it. When a seasoned stock like U. S. Steel, General Motors, or American Smelting & Refining Co., with proved earning power and splendid prospects, can be bought at a price to yield more than the going rate of interest, even the conservative investor is not likely to consider it too high. The Smelting company earned $23 per common share in 1926 after providing for all fixed charges. It can stand a material decline in metal prices and some contraction in the volume of custom business and still earn a very satisfactory profit. National Lead is another company in the mining-smelting-manufacturing class that has proved its worthiness. In January, 1925, A. S. & R. was selling at about $100 and National Lead at $158. Recently these figures were respectively $160 and $200. It is significant that with the exception of International Nickel, which advanced for special reasons, the other prominent members of this group—Anaconda, New Jersey Zinc, U. S. Smelting, and American Metal—are

today practically where they were, marketwise, two and a half years ago. The public has not bid up stocks that did not display unusual merit.

Another significant feature is the position of the copper stocks. Excepting Granby and possibly one or two others, Kennecott is the only copper producer that is higher today than it was in January, 1925. Chile, Nevada Consolidated, Calumet & Hecla, Miami, United Verde Extension, and Magma all are lower. Granby's rehabilitation accounts for its advance. Kennecott is in an enviable, if lonely, position, because of its low-cost production at Utah and Braden and its splendid financial status. As a long-pull investment many are inclined to consider most copper shares as an excellent buy at present prices.

A third group of mining companies comprises the mixed metal class, including producers of gold, silver, lead, and zinc. The average price of these shares has advanced remarkably in recent years, but analysis shows that this is the consequence more of the growth of a few big mines like the Ontario gold mines, Hollinger and Lake Shore, and the improved outlook for Cerro de Pasco, rather than a general big advance.

Some individual exceptions there no doubt are; and some speculative inflation there no doubt is. But by and large, current prices for mining company shares, considered on a long-term basis, are not very much higher than is justified by fundamental conditions. To a large extent the same probably is true of industrial, rail, and other shares.

E. & M. J. Copper Quotations

BY COINCIDENCE two telephone inquiries regarding copper quotations came to the *E. & M. J.* office the other morning. One man presented his case in this fashion—substituting round figures to simplify the question: "I understand that about 90 per cent of the copper business last week was done on Tuesday and Wednesday at 12½c. However, the quotations on the prior days (the *E. & M. J.* market week ends on Wednesdays) ranged up to 12⅞c., and the printed average for the week was equivalent to 12.625c. delivered. Now, is it not true that a miner shipping to a custom smelter and being paid on the basis of your weekly average quotation would get *more* for his copper than the smelter received?" The answer to the question is "Yes, but——."

Inquirer No. 2 supplied, unconsciously, the rest of the reply. He advanced the following: "I understand that only about one-tenth as much copper changed hands last week as in the extremely active week of May 11. During that week your average price was 13c.; last week it was 12.625c. Now, is it not true that a miner shipping a uniform quantity of copper to a custom smelter and being paid on the basis of your weekly average quotation would get considerably *less* than the smelter received?" Again, the answer is "Yes." The smelter took in and paid for during the week of low prices much more copper than he sold. The excess could be considered as making up the deficit accruing during a week of high prices when the intake was less than the quantity sold.

The first inquirer suggested that it might be desirable to calculate a weighted average for each week just as is done to determine the daily prices. If this were attempted, however, it would be logical to ascertain a weighted price for the month, and even for the year. A little reflection will show the impracticability of this.

The fact that the two situations that have just been described tend to balance each other is evidence that the result in the long run approximates the truth, and should confirm the confidence that miners, smelters, and consumers of metals place in the *E. & M. J.* quotations.

Ore Estimation in High-Grade Deposits

AN INTERESTING STATEMENT is made in the last annual report of the Castle-Trethewey Mines, Ltd., to the effect that, "in stoping certain blocks of ground the amount of ore actually recovered was less than the estimated content, and we are forced to the conclusion that the methods used in arriving at previous estimates of ore reserves cannot be depended upon to take care of all the contingencies incident to the mining of erratic ore deposits in the diabase formation. From results obtained in stoping operations it would now appear that last year's ore reserves were overestimated to the extent of possibly 20 per cent." R. J. Ennis, consulting engineer for the company, states that "in the estimate of ore reserves in 1925, assay values were much reduced and the block limits extended only for a short distance beyond the working faces. This method of estimation proved to be approximately correct. The same method, however, when applied to the estimate of ore reserves in 1926, was not satisfactory, the blocks not producing the tonnage or the ounces of silver assigned to them."

Estimation of ore reserves is obviously important, and the results of such estimates should be published regularly in annual reports. Necessarily their accuracy is predicated upon the thoroughness with which sampling, surveying, and mapping are done and the judgment exercised by the engineer. The erratic high-grade vein always will be a problem and will necessitate a conscientious study of the vein habit, without which the resulting estimates are uncertain. Standardization of methods to accord with prevailing conditions may give satisfactory results, but where stoping operations fail to check, as in the instance quoted, the need appears for additional precautions. The variables are not numerous. Either a greater number of samples by closer spacing of sampling cuts, or larger samples with the same spacing, appear as alternatives. The sufficiency of the development plan, so far as it pertains to exposure of the particular oreshoot, may be questioned, but generally additional development, unless it is necessary for future stoping operations, is not practicable. Therefore this factor resolves itself into an understanding of the vein habit and the formulation of some "factor of judgment" based upon experience gained in mining different ore blocks in the mine. Likewise the weight to be given to degrees of exposure—as, one, two, three, or four sides to a given block—can be arrived at only by experience. Just how much allowance is to be given for extensions of oreshoots, laterally and in depth, has long been a matter of argument among mining engineers, but it is seldom that a satisfactory conclusion can be reached without an intimate knowledge of the "habit of the oreshoots."

The answer to the difficulties is to be found principally in an intimate knowledge of structure and mineral distribution based upon close observation and experience in stoping.

Curtailment Forced by the Elements

FOR SOME MONTHS there has been a great deal of talk about the necessity of curtailment of metal production to prevent unduly low prices for copper, lead, and zinc. Some producers have suited the action to the word, notably the porphyry copper companies and the zinc ore miners of the Tri-State district. But as the statistics roll in, the net result is disappointing, and market observers are forced to the conclusion that, by and large, the highly recommended cut in production is far from being a *fait accompli*. Now comes news that severe wind storms have caused the collapse of the smokestack at the Falcon zinc smelter at Van Buren, Ark., necessitating its suspension, and also seriously damaged the Quinton smelter, in Oklahoma, so that part of it is expected to be down for two months. At the Garfield copper smelter, in Utah, last week, a cloudburst is said to have done $40,000 damage, a wall of water threatening to wash the plant down into Great Salt Lake. Temporary suspension of operations resulted. Thus have the smelter men been warned by the elements. Perhaps now if we have an earthquake the miners also will take notice.

The need for reduced production is very real. Consumption of practically all of the non-ferrous metals palpably has fallen off in the last few months. Production so far has not shown a corresponding drop, and prices accordingly have sagged materially. A slight decline might have been expected, to accord with a similar trend in general commodity prices, but the non-ferrous metals have dropped faster than they should have done and dividends are beginning to be affected. Too many producers are maintaining or even increasing production rates in an effort to keep down unit overhead costs. They apparently are adhering to the old adage that "It's a great life if you don't weaken," disregarding the more modern version, "It's a greater life if you weaken just a little."

Manganese Poisoning

DURING THE RECENT TRIAL of a damage suit in Virginia for alleged manganese poisoning, an astonishing amount of testimony was offered by the defense simply to demonstrate that the oxide of a metal need not necessarily have the properties of the metal because the metal is contained in it. Apparently the defense felt that it could not run the risk of an adverse decision arising out of the jury's ignorance of elementary chemistry. Without such instruction it is quite likely that the Virginia jury, or the average jury anywhere, would have reasoned that manganese is manganese and that the ore must be poisonous if the metal contained in it is.

The case, that of Garrett Haun vs. Hy-Grade Manganese Co., appears to be the first of its kind on record in the United States. The plaintiff claimed to have suffered injury, physical and mental, from inhaling manganese ore dust in the company's grinding plant at Strasburg. His symptoms were declared to be those of manganese poisoning by the specialist who testified for him. In the whole history of medicine only fifty cases of manganese poisoning had been reported, it was said. In these, the poisoning appears to have been caused by metallic manganese, and the defense declared that manganese dioxide was non-poisonous. Testifying for the latter, Dr. C. K. Reiman, of Harvard, described how, after experimenting on cats and dogs, he had fed a spoonful of the dioxide daily to twelve men at the university for some time without their showing ill effects. Instead of manganese poisoning, it was a kind of sleeping sickness from which the plaintiff suffered, it was asserted.

Despite the variety and volume of testimony offered, the issue narrowed down, as the jury was finally instructed, to whether manganese dioxide ore was a metal. Happily, the jury found that it was not a metal, indicating thereby that there is hope for the jury system after all.

Lithographer's Stone Not Wanted

AN INTERESTING CONTRIBUTION describing the occurrence of lithographer's stone in Manchuria was recently received. Though not precisely adapted for *E. & M. J.*, the editor thought that its local comtemporary *The National Lithographer* might be interested. The MS. was submitted to the editor of that magazine, who, in a letter of acknowledgment, comments thus: "Your letter gave me the best laugh I have had since the rainy season started. I haven't the slightest doubt that in Manchuria there can be found stone that might be used for lithographing—if lithographers used stone; but the fact is there has not been made and sold in this country a single stone lithographing press for more than five years. We use nothing but metal plates in more than 90 per cent of the shops in this country, and there are enough stones here now to supply for a hundred years such old stone presses as are running . . . . The German stone is found in leaves, and all that has to be done to make it ready for the press is to clean it off and saw it to the size of the press, while all other stones are found in blocks that have to be sawed into strips—which costs more than the stone can be sold for." The quotation seems to imply that on prospect trips not much time should be wasted over formations of "lithographic stone" unless it is suitable also for building purposes and is at tidewater or on a railroad spur.

Gold by Airplane

EVEN Col. "Slim" Lindbergh, the Lone Eagle, may not, the guess may be hazarded, know all the advantages of aviation. For instance the transportation of gold by airplane is much more economical than by other means. Not only is there an important saving of interest because of the shorter time consumed, but insurance rates are lower for the reason that the liability of theft is decreased. The economy is particularly evident in the case of gold bullion produced at mines in remote sections where a long haul through sparsely settled country offers attractive opportunity to highwaymen. At the recent general meeting of Crown Mines, Ltd., the chairman estimated that a saving of £100,000 would have been effected by the gold-mining companies of the Rand if export of gold overseas had been by air instead of surface transport. He sees the early establishment of such a service. Perhaps he is overenthusiastic when he says that "in a few years from now the probabilities are that South African towns will consider airdromes as essential as railway stations." Perhaps we in the United States need waking up.

In the Compound of the Wesselton Diamond Mine, South Africa

A group of native "boys" at mealtime at this property of the De Beers Consolidated Mines Co., at Kimberley

Wash day in the compound

Methods Used on the Comstock Lode For Lowering Sticky Ores

By Thomas C. Baker
General Manager Fresnillo Unit, The Mexican Corporation, S. A.,
Fresnillo, Zacatecas, Mexico

A MAIN TRANSPORTATION ADIT directly below and connected by ore transfers with sub-haulage levels is usually a simple and desirable arrangement for handling ore at a low cost, yet on the Comstock Lode, at Virginia City, Nev., such a layout necessitated special methods on account of the peculiar conditions existing.

Stoping on the Comstock for the last five years has been practically confined to the old filled stopes of the near-surface bonanza oreshoots. These stopes were filled by early operators with low-grade vein material, which is quartzose, and with wall material, which is andesite, sheared and leached in most places so as to resemble a gouge. Surface water percolating through these fills has formed a gummy substance that is extremely hard to handle. On the other hand, there is enough hard quartz in the fills to wear out timber linings very rapidly. The proportions of gouge and quartz vary, but the average product is both sticky and abrasive.

As all ore transfers require timber to support the ground, complications are introduced where the ore has to be dropped any great distance. The United Comstock company, at the start of operations, tried to handle the ore through a long ore transfer, but the timber lasted only a short time. The sticky character of the ore prohibited velocity controls at various levels, because these would have required constant attention, and an uninterrupted drop was impracticable on account of severe wear on the timber. Finally the company solved the problem satisfactorily by using automatic skips that discharged into an ore pocket at the bottom of the shaft, from which pocket the ore was drawn directly into ten-ton cars of the main haulageway system.

United Comstock Practice

Fig. 1 shows the somewhat novel design of the skips built by the United Comstock for a vertical ore pass, and also the design of the landing chairs that operate the doors. The body of the skip is cylindrical to impart the greater rigidity needed where there can be no cross-member at the bottom of the skip to brace the main vertical frame. Apparently the objection to this construction is that the cross-sectional area of the body is relatively small compared to that of the shaft. The capacity of a shaft compartment is reduced, therefore, by the use of this type of skip, even though the guides are placed in opposite corners in order to utilize as much of the compartment as possible.

The skips operated in counterbalance, the loaded skip being used to raise the empty one. Doors were held closed by the tension on the cable. Consequently they opened by their own weight (and that of the sliding bale to which they are attached) when the lugs on the body struck the chairs and the tension was released. They were closed as the rope picked up the body again. The mechanism was subjected to considerable strain, as it did not function properly unless the skip was stopped with a jar. Furthermore, the chairs were exposed to spills of rock. Notwithstanding these drawbacks, repair costs were fairly low. The following costs

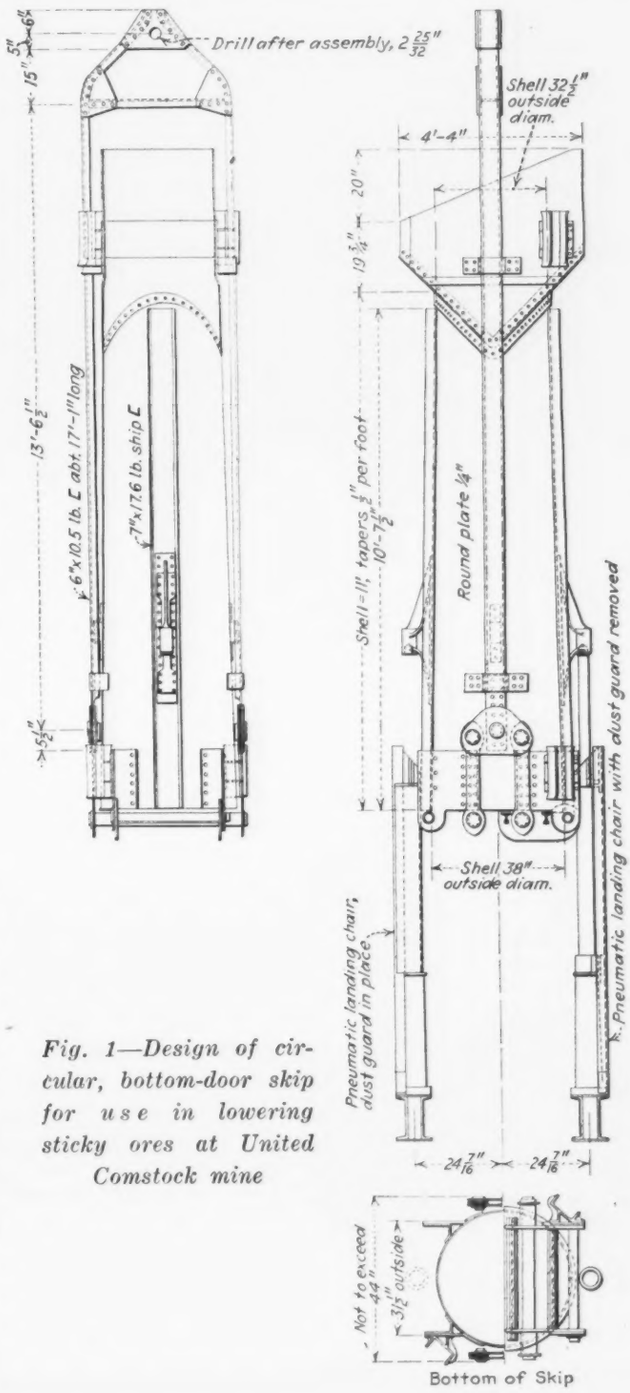


Fig. 1—Design of circular, bottom-door skip for use in lowering sticky ores at United Comstock mine

are averages for thirty-one months of operation, during which period 754,893 tons of ore was lowered:

	Per Ton Lowered
Labor	$0.024
Supplies	.003
Total	$0.027

The driving sheaves of an old hoist of the Whiting type were installed at the top of the shaft; and the hoisting rope, the ends of which were attached to the skips, passed around these sheaves enough times and in such a manner as to develop sufficient frictional grip. Control of the hoist was effected by brakes of the post type applied to the brake drums by means of an air cylinder. The design called for a small motor and clutch to be used to move the skips when both were empty. Unfortunately this provision was omitted and chain blocks were needed if the empty skip was raised above the lip of the loading chute, or if the engineer failed to jar the loaded skip enough to open the gates.

From an operating standpoint the skips handled the ore at a low cost and the layout gave little trouble. Figures are lacking as to the total cost of the installation, but it was undoubtedly high. A simpler, and probably more satisfactory, dumping arrangement would have been a heavy underswung arc gate covering the bottom of the skip and suspended from a heavy trunnion attached to the body of the skip. This gate could be opened and closed by dump rollers, attached thereto, when they travel through slot-like guides, curved to impart a free swinging action to the gate.

Pipe Ore Pass for Handling Ore at Middle Group

Comstock Merger Mines, Inc., purchased the mill and mining properties of the United Comstock company on Oct. 1, 1924, principally to obtain the mill for its own property, which covered the "Middle Group" of mines on the Comstock Lode. The United Comstock company was nearing the end of its operations at that time. Hence the sale was mutually advantageous, as it provided the Comstock Merger with a first-class mill for less than it would have cost to build one and at the same time brought the United Comstock company more money than the salvage value of its equipment.

The United Comstock had a main transportation adit at a horizon below the orebodies of both groups. This adit had its portal near the mill at American Flat and ended within 350 ft. of the ground owned by the Comstock Merger Mines, its total length being 10,300 ft. The adit was extended 3,400 ft. by the last-named company. Connection from it to the existing workings was made by raising a two-compartment shaft. It was originally planned to lower all the ore through this shaft to the haulageway, following United Comstock practice, and to provide an independent shaft for men and materials by stripping and retimbering an existing winze that had been sunk to develop the property. As there was no immediate need for a supply shaft, work on it was held in abeyance pending completion of the ore shaft.

In the meantime, certain developments in the ore areas had raised grave doubts as to the final outcome of the venture. In view of this uncertainty it was considered prudent to reduce the risk by spending as little money as possible to put the mine on an operating basis. The extension of the adit and the two-compartment shaft were too near completion to stop, but considerable money would be saved if the ore shaft could be used for men and materials as well as for ore. A cage with an underhung skip was considered, but was rejected because there were enough complications in the design of the skip without introducing an overhead cage. Furthermore, the combination would entail an extremely long structure and a very heavy one in proportion to its capacity, which in turn would require a heavier and more expensive hoist than would otherwise be needed. A transfer device for interchanging skips and cages was also considered. As the shaft did not come to the surface, there was no place to install this device except in heavy ground, which would require heavy and expensive timbering. Moreover, both schemes were locally impracticable on account of the sticky character of the ore, which prohibited the use of loading pockets having any storage capacity. It was therefore to be expected that there would be delays in tramming while men and materials were being handled. Separate shafts, one for handling ore and one for men and material, offered the simplest solution, but this scheme involved an expenditure that was not warranted under the existing circumstances.

While ways and means were being considered for solving the problem at the least cost, it was suggested by Frank Collins, of the Joshua Hendy company, that we should try dropping the ore down a 20-in. pipe. The advantages of the scheme were immediately recognized, but its feasibility was a matter of conjecture, as neither Collins nor ourselves had ever heard of dropping ore 600 ft. through a pipe. Collins contended that the wear would not be severe in a vertical pipe, provided that it was kept empty, as very little attrition would result in a straight and uninterrupted drop. Doubts also existed as to whether the sticky ore would hang up in the pipe, and whether the ore could ever be drawn after it had been literally shot into a bin at a high velocity. The last point seemed to present the most serious problem. Great difficulty was being experienced in drawing ore from chutes even where the fall was low; furthermore, a blast close to a set of timbers would often plaster the timbers with clay in such a manner as to resemble gunite.

On investigation it was learned that cylindrical ore chutes of wood staves or light steel plate had been used successfully in stopes in Australia and that various articles had been published that describe the practice. Mention was made in one article that 15,000 tons of ore had been dropped through a steel pipe 150 ft. long without undue wear, but no record could be found anywhere of any experience with greater heights of fall. To test the scheme, a galvanized pipe was placed in an ore pass 70 ft. long, this being the longest one available at the time, and ore was passed through it until the pipe was no longer serviceable. The results were surprisingly favorable to the scheme; the pipe lasted longer than was expected, and there were no hang-ups unless the pipe was allowed to fill. As there was no time for further investigation, it was decided that there was enough merit in the scheme to justify its adoption when caution clearly indicated the necessity of minimizing the expenditures required for equipment and preparation.

The shaft had two compartments, each 5 by 5 ft. inside timbers. One compartment was used to handle men and materials and the other to accommodate two pipes and a small cross-head with platform, employed

for installing or changing pipe. A pipe with an internal diameter of 19¾ in. was selected because there was just enough space for two pipes of this size in one-half of the compartment, the other half of the compartment being needed for handling the pipe. It was thought that a pipe of this diameter would take the ore without choking if the largest piece did not exceed 10 in. in size; and this size was acceptable, as it would necessitate very little work on the grizzlies.

The next problem was to select the kind of material that would prove the cheapest in the end. Manganese steel was preferred, but the need for reducing cash outlay as much as possible again influenced the decision. Either wrought-iron or white-iron pipe would cost less, and there was a good chance that a pipe line of either material would outlast the mine. In the table at the foot of this column are the prices and weights of the different kinds of lines considered.

White iron was the choice over wrought iron, because it provided, at a slight additional cost, a much thicker wall of material possessing greater resistance to attrition.

Flanges cast as an integral part were used, as they simplified the support of the column, which weighed 79 tons. Wood fillers, or gaskets, ⅞ in. thick, were used to take up strains that would develop at the flanges as a result of shaft movement or settlement of any part of the line. It was an easy matter to cut away the wood to obtain the necessary clearance for changing a single pipe. Some sort of filler is needed where the faces of the flanges

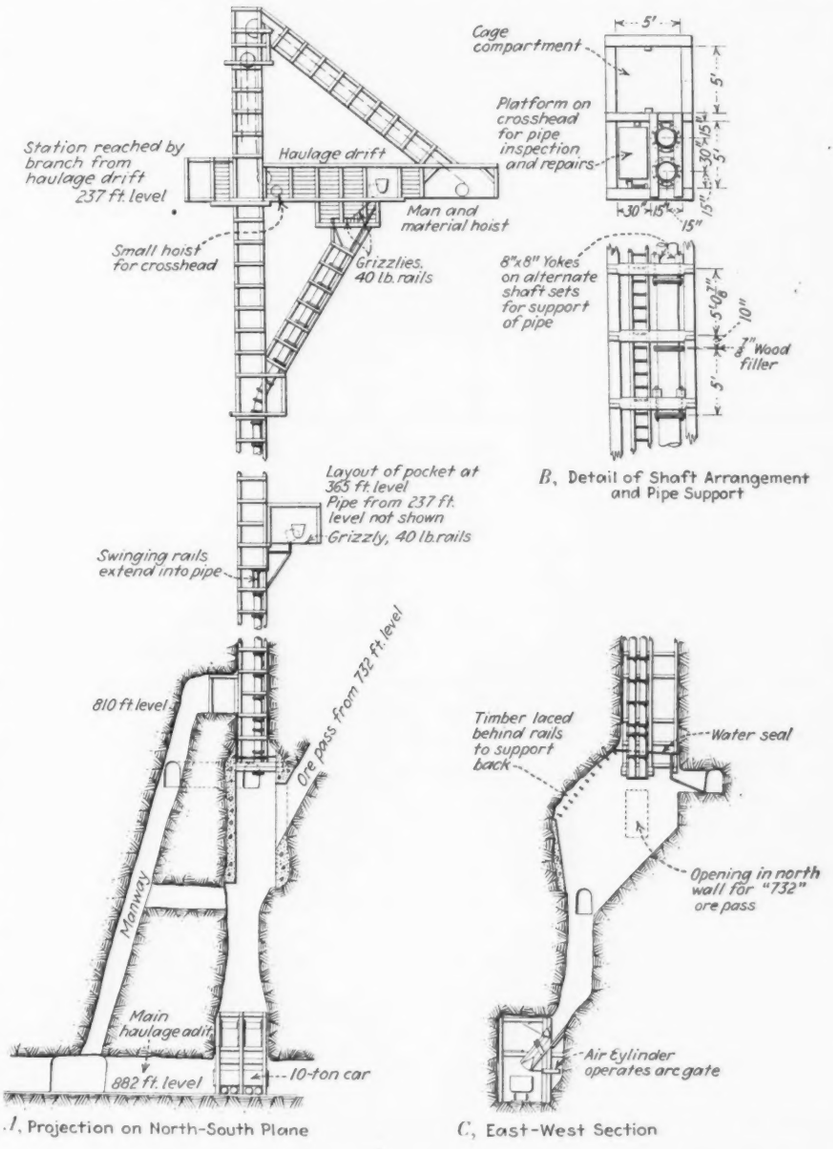


Fig. 2—Pipe ore transfer installed by Comstock Merger Mines, Inc., at Virginia City, Nev.; A, vertical section; B, detail of pipe compartment and emergency ladder way; C, detail of offset discharging into loading pockets

are rough and uneven and where the ground is heavy and likely to move the shaft and pipe line. Wood proved entirely satisfactory and did not wear beyond the inside wall of the pipe.

As the shaft sets were on 5-ft. ½-in. centers, pipe lengths of either 5 ft. or 10 ft. ¾ in. were necessary in order to maintain the same vertical relation between sets and flanges. The shorter length was selected not only because it was easier to cast and to handle but also because it had greater structural strength. Every other flange rested on iron clamps placed across the compartment; 8 by 8-in. timbers would have answered just as well if there had been sufficient room.

As stated before, enough space remained in the pipe compartment to accommodate a small crosshead with a platform served by a small hoist. One guide for the crosshead formed part of the ladder, as shown at *A*, Fig. 2. This ladder was for emergencies only. Experience showed that pipe could be carefully installed at an average rate of fifteen lengths per shift and that a cracked or worn pipe could be replaced in one to two hours.

Dropped carefully, rocks will fall considerable distances in a large, vertical pipe line before they strike the inner wall (the distance depends upon shape and specific gravity; a wooden wedge spins and bounces about, making a great racket, whereas an iron ball is not noticeably affected by the frictional resistance offered by the currents of air). The lower the angle of incidence the lighter the blow: consequently, wear on the pipe can be minimized by feeding the ore so that it enters the line with little or no angular velocity. With the foregoing in mind, original plans called for an ore pocket at the 237-ft. level, with a slow-speed

Material	Thickness of Wall, Inches	Unit Length, Feet	Weight per Foot, including Flanges or Clamps, Pounds	Cost per Foot, F. O. B. Comstock
Manganese steel	¾	10	180	$22.50
Wrought iron	¼	20	123	9.56
White iron	1	5	289	10.75

pan conveyor to feed the ore into the pipe. There is no doubt that this would have been a satisfactory arrangement if the ore had not been so extremely sticky. Meanwhile it had been discovered that the ore would pack and hang up, even under favorable loading conditions. Therefore, it was almost certain that the ore pocket and pan conveyor would require constant attention, which would prove expensive on a fairly low tonnage basis.

By this time our worst fears were being confirmed by unfavorable developments in the ore areas. This made it necessary to reduce cash outlays to the absolute minimum. The more expensive arrangement outlined above was discarded in favor of a small hopper at the level which would act as a funnel for the pipe, the ore to be dumped directly from the cars into this hopper. In order to connect the line with the haulage level at the least cost, the pipe was carried up through an inclined raise that had been driven for the purpose of excavating the ore pocket, giving the arrangement shown at *A* in Fig. 2.

The plans called for two lines to the 237-ft. level. One was to be a reserve line, the bottom part of which would be used for handling ore from the 365-ft. level after this level had been opened. To economize, the second line was not installed until needed and then only as far as the 365-ft. level. One line serving more than one level was considered, but the idea was rejected for fear of choking. The 365-ft. level was driven so that the ore could be dumped directly into the vertical line, overcoming the bad features of the 237-ft. level line that were the result of circumstances rather than lack of foresight. Therefore, instead of feeding the ore gently and at a uniform rate as originally planned, it entered the vertical line with great angular velocity. In judging results, this point should be kept in mind, as this unfavorable method increased the hammering action of the rocks on the pipe, thereby decreasing its life.

Experience with the Pipe Transfer

Elbows made of white iron were installed at the bend, but they shattered in less than two weeks. Manganese steel was substituted, the elbow being made in segments so that the pieces receiving the greatest wear could be replaced without disturbing the others. The liner which bore the brunt was 1¼ in. thick and lasted fifteen weeks. It did not crack or shatter, but stayed in place until it was worn through, demonstrating the desirability of manganese steel for this service.

Bad cracks appeared in the original line a few days after it was put in service, portending a dismal failure to the experiment. It was noticed that all cracks started to open at the bolt holes in the flanges. Clamps proved useful in delaying the spread of these cracks and in holding the broken segments together until the pipe was badly shattered. However, it became necessary to replace the bottom 400 ft. of the line after the pipe had handled about 75,000 tons of ore.

Soon after the cracks appeared the column was plumbed and found to deviate from the vertical in several places as much as 5 in. (the result of too much haste in the original installation and also of subsequent shaft movement), and a careful inspection showed that the breakage was most severe at or below these places. As the pipe was removed, each length was studied carefully. Less than 50 per cent showed signs of appreciable wear, although nearly every length had been cracked or shattered. Except for the upper 200 ft., which was still in good condition, there was no relation between wear and the length of fall, as some of the pipe at the bottom showed less wear than other parts of the line. As in the case of breakage the wear was greatest where the pipe was out of plumb. It was recognized from the outset that the success of the scheme depended mainly on the assumption that there would be little wear in a vertical line; consequently, the experience was not conclusive when the principal requisite had not been fulfilled. Breakage, rather than wear, was the principal cause of early failure, showing that the pipe was too brittle, besides being out of line.

In replacing the pipe, greater care was taken to see that every length was plumb. White iron was used again, but a tougher and more malleable casting was obtained. At the same time the line to the 365-ft. level was installed. Both lines were in service for seven months when operations were stopped. During this period, the line to the 237-ft. level handled 76,000 and the other 60,000 tons without giving any trouble whatever. The pipe was not salvaged when the equipment was sold, as the cast iron had little scrap value, owing to a high freight rate to the nearest market.

Advantages of New Method

A few lengths in the long column were removed at different points and examined carefully for wear. The internal diameter had been increased ⅛ to ⅜ in., indicating an average wear of about 7½ per cent. Assuming that 75 per cent of the original metal content is needed to provide a conservative factor of safety against breakage, the column would have handled about 20,000 tons of ore at the rate of wear indicated by the first 60,000 tons. Although the results are far from conclusive, they at least forecast the final economic success of the scheme, even under the unfavorable loading conditions that existed. There is no reasonable limit to the capacity of the pipe itself; it will take the ore as fast as it can be dumped from cars having a capacity of 36 cu.ft. The rates at which the ore can be passed through the grizzly or taken away at the bottom limit the capacity of the layout.

In using only part of the cross-sectional area of a shaft or ore transfer, the pipe leaves the remainder free for ventilation. This is an advantage as against ordinary ore transfers, where velocity controls have to be used to protect the timbering. These controls either restrict or shut off the circulation unless the air is bypassed through auxiliary raises and connections, which are expensive.

Contrary to expectations, the ore did not pack in the ore pocket at the bottom of the line. In fact, the loading chutes at the pocket gave less trouble than those where the ore was dropped short distances from the stopes. Undoubtedly there is some drying action when ore falls a considerable distance, which helped, but the construction of the ore pocket accounted in a large measure for the favorable results. Referring to *C* in Fig. 2 it will be noted that the ore was not discharged directly into the bin. It strikes the rock wall with terrific force and rolls or sprays into the bin. The rock, of course, was quickly worn down to a shelf, the action stopping, however, when this shelf began to build up with fine material. However, there was enough coarse material to scour away any excessive accumulation, and the process of building up and tearing down went on constantly within the limits above noted. It was

observed that the fine material, which caused so much trouble in ordinary chutes, lost most of its momentum when it struck this soft bed, and entered the bin with little velocity. Anyone who has had much experience with sticky ore probably knows that hang-ups can be minimized by the use of offset pockets and that they are decidedly worth while where any considerable amount of ore has to be handled.

The shaft made enough water to have caused no end of trouble if the water had reached the sticky, clayey ore in the pocket. If skips had been used it would have been almost impossible to prevent this condition, except by concreting the shaft. Referring again to *C* in Fig. 2, the concrete seal at the bottom of the shaft catches the water, yet does not interfere with the fall of ore within the pipe. It is believed that this feature alone will justify a pipe transfer where water in an ordinary ore transfer causes trouble at the loading chutes and through the crushing plant.

Cost of Operation and Saving Effected

No labor was required except at the grizzlies. Whether grizzly attendance should be considered as an operating charge against the pipe depends upon conditions. If the size of the primary crusher limits the feed to a maximum 8 or 10-in. size, then it is not a proper charge in comparing this scheme with any other method, as the same grizzly opening would be needed in any event. In our case it was considered as part of the cost, as the use of large skips would have done away with any need for labor at the grizzlies. On the other hand, the pipe saved a hoist man and skip tender.

Replacements have to be considered, but data are lacking to show what this cost would have been. It would not be fair to estimate on the basis of the first line, as conditions were abnormal. If a small pocket had been used at the top of the 237-ft. level line, instead of a long incline and bend, it is believed that white-iron pipe properly cast and laid and costing not over $8,500 installed would have handled at least 250,000 tons of ore; that manganese-steel pipe with a ¾-in. wall, costing not over $15,000 installed, would give at least five times the service; and that in either case not over 75 per cent of the pipe would have to be replaced to double the duty.

It was estimated that the lines to the 237-ft. and 365-ft. levels could be installed and replaced once for less money than would be required to strip and retimber the existing winze and equip it with skips and hoist in accordance with United Comstock practice. If the use of skips had meant an entirely new shaft, with connecting crosscuts at the different levels, the pipe would have shown a still greater saving.

It is hard to say whether coarse ore would cause more wear on the pipe than a mixture of coarse and fine, but I am inclined to think that there would be less wear, as there would be fewer points of contact. A manganese pipe seems clearly indicated in the case of coarse material, as it would withstand the hammering action of the large pieces far better than white-iron pipe. A pipe ore transfer would prove useful in handling dry and dusty ores, as the dust nuisance could be controlled easily. It is believed that if separate costs had been kept on wood-lined ore transfers of equal length, results would have shown that wood lining is more expensive than pipe and more troublesome.

It is unfortunate that the experiment was still in an inconclusive stage when the mine was shut down. It lasted long enough, however, to convince those who were in touch with the situation that the scheme is entirely practicable and advantageous under certain conditions. Its use seems indicated wherever there is a large tonnage of sticky, dusty or even coarse abrasive ore to be dropped through a long timbered ore transfer, or any wet ore transfer where the water gives trouble. If the ore is sticky a layout similar to the one at the 365-ft. level will prove satisfactory. Under other conditions a larger pocket with a mechanical feeder would be more desirable, as it would deliver the ore to the pipe with less horizontal velocity. The line should not deviate from the vertical and the pipe should not be brittle, otherwise it will not withstand the hammering action of the large pieces. However, judged by the performance of the line to the 365-ft. level, the rocks will not bounce in the pipe if they start through it in a fairly straight path.

A separate line for each level seems advisable, which limits its application, as a number of long lines would prove too expensive. However, a heavy Y of manganese steel, with a long sweep and made up in removable segments, would make it possible to feed the ore into the column at an intermediate point. The objection to this scheme is not so much the resulting wear at the junction, as this should not prove unduly expensive, but the liability of choking the pipe. Even if the delivery of ore could be controlled by signals so that two streams would not meet, there is the possibility that the ore will spread when it reaches the enlargement and choke as the area is reduced to the normal area of the line. The scheme was considered dangerous, as a long pipe line choked with ore would be no easy thing to clean.

If the ore is wet the ore pocket should be offset, as otherwise the ore will pack. This is an important point and applies to any ore transfer handling sticky ore, whether pipe is used or not. As the pipe must be kept empty the pocket must be large enough to provide ample storage. The cage tender made an inspection of the pocket twice a shift to make sure that there was a safe amount of storage below the bottom of the line; and the inspection took only a few minutes, as the top of the pocket was easily reached from the bottom of the cage compartment.

The economic limit to the length of a line is problematical. In a drop of 600 ft., wear at the bottom of the pipe was no greater than in the middle portion. In a longer line the rotation of the earth might introduce a new factor which did not seem to appear in a 600-ft. line. The pipe will handle any kind of ore as fast as it can be fed into the pipe or taken away at the bottom. It did not build up with sticky ore, nor will it choke as long as it has a free discharge. Timbers frequently passed through the grizzlies, but they did not lodge in the pipe.

Summarizing the foregoing, the pipe transfer will require little attention and give almost no trouble if the following requisites are fulfilled: The line must not deviate from the vertical; the pipe must always have a free discharge; the material in the pipe must wear well, but not be too brittle; and the arrangements at the top and bottom must be along the lines recommended. Given the foregoing, the scheme is not such a "pipe dream" as it was first called, as the results obtained strongly indicate its usefulness where conditions are similar.

California Gold Dredge in Operation Over Twenty Years

Only One Shutdown of Five Weeks' Duration—Output 30,316,814 Cubic Yards and Gold Recovery More Than $2,000,000

By George J. Young
Associate Editor

A REMARKABLE instance of the great endurance and strength of modern mining machinery is afforded by the record of Feather River Dredge No. 1, operating in the vicinity of Oroville, Calif. I visited this dredge upon several occasions and finally obtained notes about its history from C. H. Thurman, who has been in operating charge for many years. The substance of these notes is as follows: Feather River No. 1, a 7½-cu.ft. gold dredge, was built in 1906 for the Feather River Development Co., predecessor of the Natomas Company of California, and began operations on Dec. 22, 1906. It is still operating (see front cover) after more than twenty years of continuous service and its record for length of service, yardage, and costs has probably never been duplicated.

C. H. Thurman

The dredge was built by the Yuba Manufacturing Co., of Marysville, Calif., the hull being constructed under the supervision of the late A. D. Taylor, pioneer dredge builder of the Oroville district, and the machinery was installed and the dredge put in operation by L. D. Hopfield, now manager of the gold-dredging division of the Natomas Company of California. The dredge was the first of a series of modern California-type gold dredges built by the Yuba Manufacturing Co., of which nineteen others were soon thereafter placed in service on the Feather, Yuba, and American rivers. All were practically of the same yardage capacity, but individual dredges were constructed to mine deposits at various depths.

The lumber in the hull of Feather River No. 1 was of the finest Douglas fir, especially selected and delivered on the ground in the late spring of 1906, and was therefore thoroughly dry when framed and put into the hull in the dry summer months. The fact that this lumber was thoroughly dry was the contributing factor to the long life of the wooden hull.

The hull is 40-ft. beam, 100 ft. long, and 8 ft. deep. Maximum digging depth is 50 ft. Conveyor and digging ladder are of the open-girder type. Digging buckets are each of 7½ cu.ft. capacity. The conveyor belt is 32 in. by 192 ft. The washing screen is 6 ft. in diam-

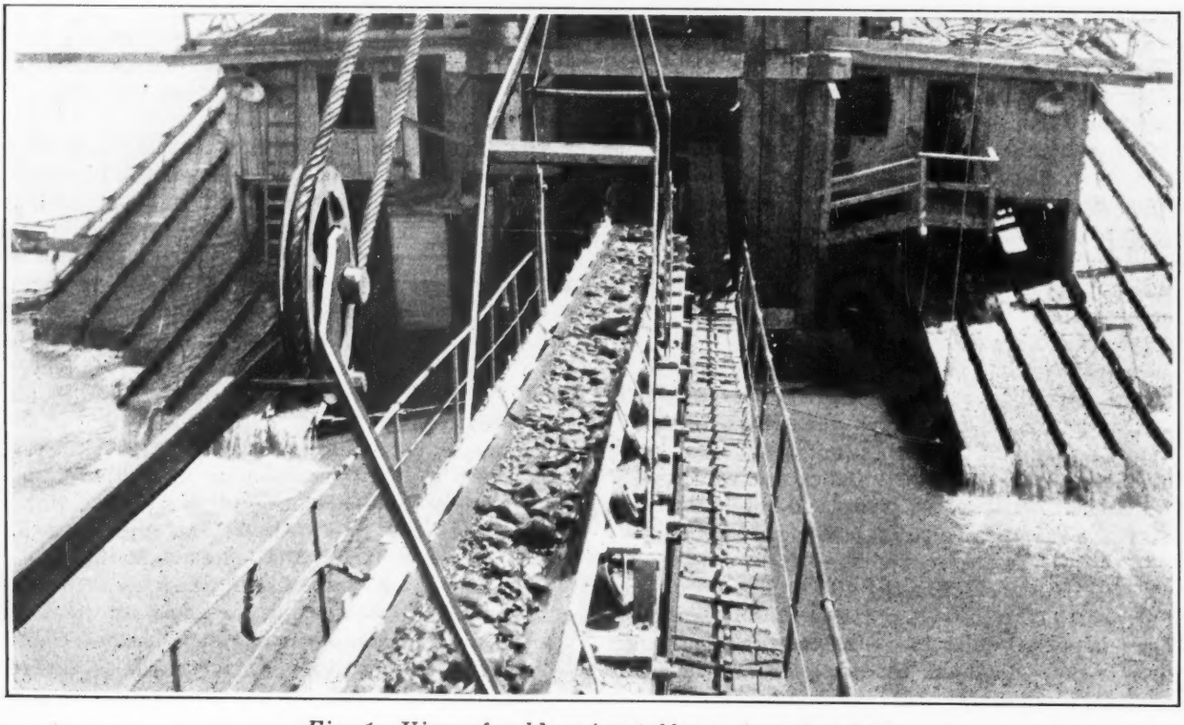


Fig. 1—View of gold-saving tables and stacker belt

eter by 18 ft. It has tapered perforations ⅜ to ½ in. Spuds are 24 by 36 in. by 54 ft. long. The dredge is equipped with 2,200 sq.ft. of gold-saving tables with Hungarian riffles, and 1¼ in. fall per foot (Fig. 1). Total installed electrical motors provide 308 hp. The voltage is 4,000, reduced to 440 by transformers on board the dredge. There are two 8-in. and one 3-in. centrifugal pumps. Two ladder hoist lines are used in parallel. Each is 1 in. diameter by 450 ft. Bow swinging lines are ⅞ in. diameter by 800 ft.; stern lines ¾ in. diameter by 500 ft.; spud hoist lines 1 in. diameter by 450 ft.

Upper and Lower Tumblers

The upper tumbler has a cast-steel body with hollow bored shaft and is equipped with cast-steel removable cushion or jacket plates upon which are bolted chrome nickel-steel wear plates, the latter taking practically all the wear, the body of the tumbler giving ten years' average service, the jacket plates four years, and the wear plates seventy days' service. The shafts in these upper tumblers have given unusual service, the first one having been removed on account of the wearing out of the body of tumbler after nine years of service, and the present one has been in use eleven years.

Fig. 2 shows the lower tumbler, now in use, which has given nine years of service. It is a one-piece cast-manganese steel part, with hollow bored shaft pressed in, no side or tread plates being used, the shaft being replaced about every four years on account of wear in the bearings. The lower tumbler bearings are rebabbitted about once every six to nine months, on the shaft in the field, this being done to secure a good fit on the shaft, which usually wears unevenly owing to the presence of grit and mud under water.

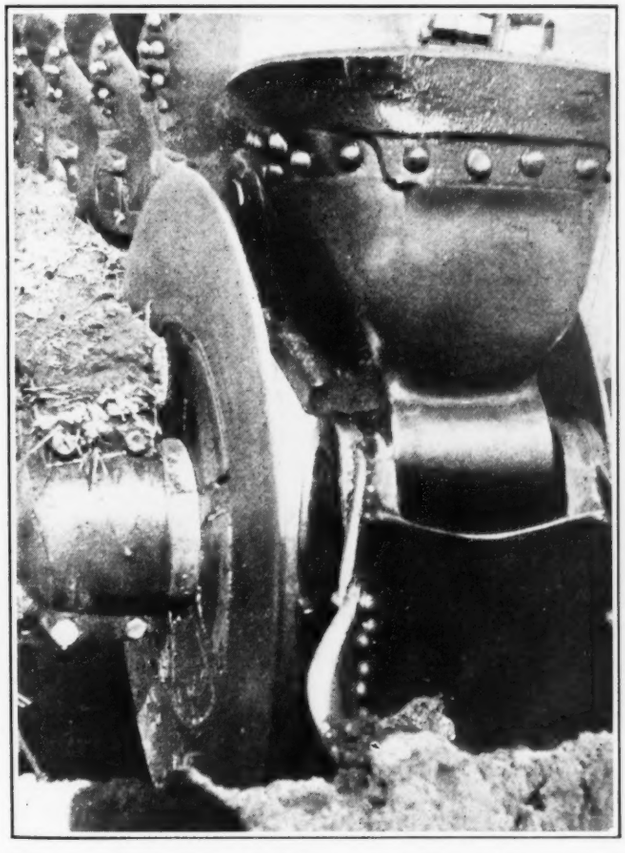


Fig. 2—Manganese-steel lower tumbler. No wearing plates are in use upon this tumbler

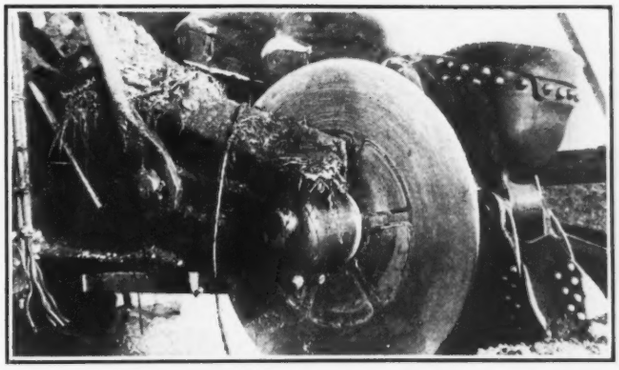


Fig. 3—Manganese-steel buckets after eleven years' continuous service

The sixty-eight digging buckets (Fig. 3) are of cast-manganese steel, with hood cast integral. Their "inside-outside" lip, designed by L. D. Hopfield, of manganese steel, is attached by twenty-six rivets. The bucket line now in use was installed May 1, 1916. After over eleven years of service not a single failure in the sixty-eight buckets has occurred, and the buckets are apparently good for several years more. Their long service is to be credited in large measure to the design of the upper tumbler. The bucket pins are 5¾ in. in diameter and the lugs are machined for a forced fit in the bucket lug recess, which prevents the usual wear in the front eye. The back eye of the buckets is refitted with a forced-fit manganese-steel bushing about once every six months, oversize bushings being carried, thus preventing excessive wear in the back eye of the bucket.

Late in 1915 it was necessary to move the dredge some distance through ground that had already been dredged, so as to get it to new ground. It happened that the route selected was along practically the same line as that required by an irrigation canal project, and it was finally agreed that the canal could be advantageously built by the dredge as it worked its way through the dredge tailing, and with this objective in view the tailing conveyor was mounted on a pedestal so that it could be moved to either side of the center and the tailings could thus be dumped on either bank, as the dredge made its advance on the desired course. Figs. 4 and 5 (both illustrations were taken from the same position) show the tailing conveyor dumping exactly in the center and then to one side after the stacker had been swung to the side. Ballasting pontoons were bolted to each side of the hull near the stern so that they could be either filled with water or emptied to keep the hull on an even keel whenever the conveyor ladder was swung to either side. The swinging of the conveyor to the side position was easily accomplished and required only a few minutes time, without, however, necessitating a shutdown. Some 2½ miles of canal, spillways, and intake were built by this arrangement, the main canal intake having a minimum width of 80 ft. and a depth 12 ft. below the natural water level of the tailings. Fig. 6 shows the Western Canal (a subsidiary of the Great Western Power Co.), one of the large irrigation projects which

Fig. 4—Tailing conveyor or stacker in center-line position while digging a canal

Fig. 5—Taken from the same position as Fig. 4 but showing the stacker dumping 26 ft. from the center line of the dredge

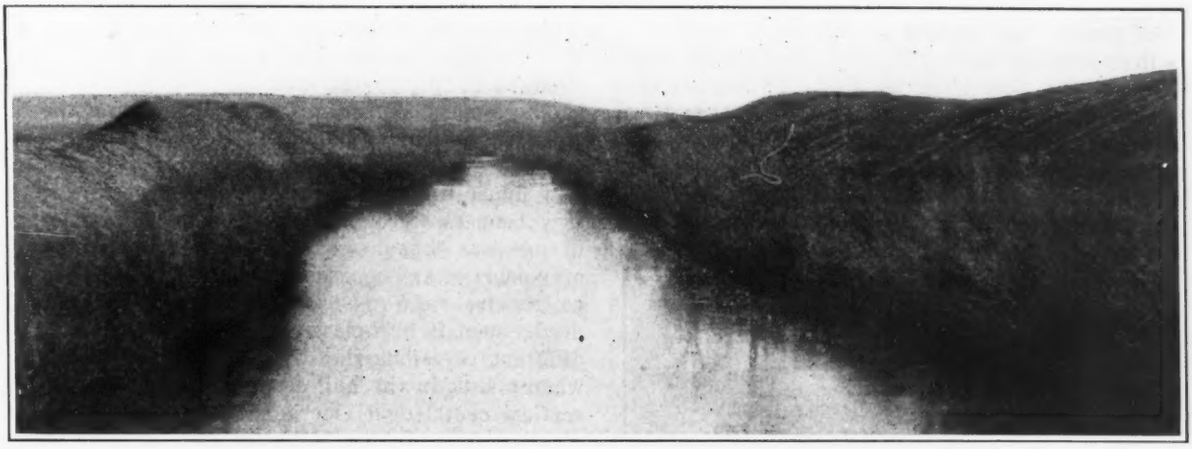


Fig. 6—Western Canal Co.'s canal, 80 ft. wide and 12 ft. deep. Constructed by the dredge when moving to new ground. Canal is shown twelve years after construction

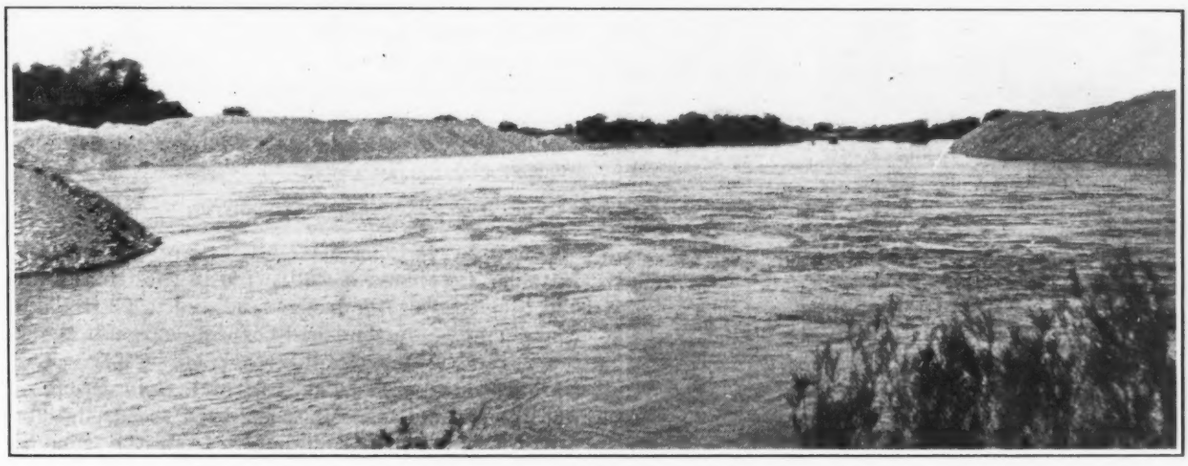


Fig. 7—A 400-ft. channel was excavated by the dredge and the Feather River was turned into the new channel to permit of rehabilitating a county road

Fig. 10—Board of directors and stockholders of the Thurman Gold Dredging Co., Inc. From left to right: W. H. Turner, treasurer and dredge master; Edward Marks and G. B. Blanchard, winchmen and directors; L. Lasater, amalgamator and secretary, C. H. Thurman, president and manager

was brought into use several years earlier than would have been possible had the dredge not been available at the opportune time. More than three million cubic yards of gravel was handled in this canal work.

The main Oroville-Marysville road, known as the river road, was finally abandoned by Butte County in 1918 on account of the encroachment of the Feather River after difficulties in maintaining it for thirty years. The river washed away the bluffs below Oroville until the cost of cutting down the bank to make room for the road became prohibitive. With the re-establishment

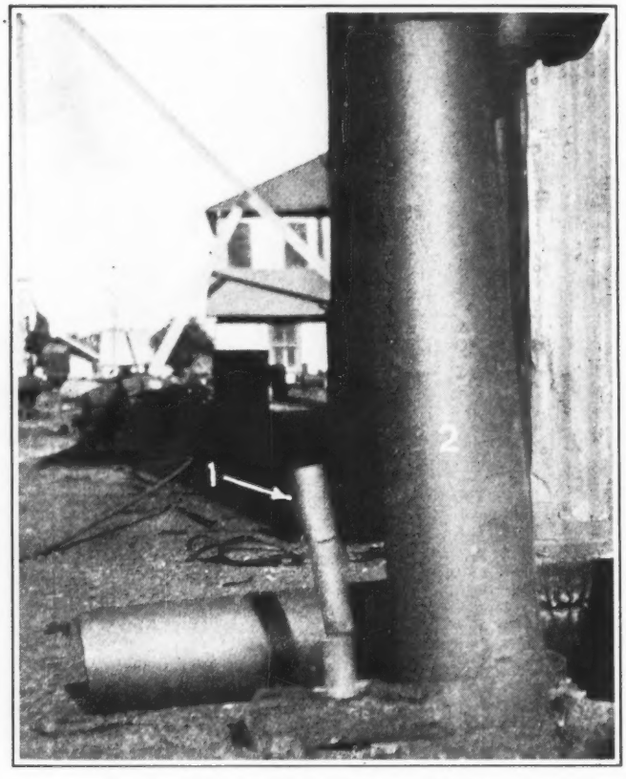


Fig. 8—Progress of gold-dredge construction. No. 1 is a bucket pin of 1898; diameter 1⅝ in. No. 2 is a bucket pin of 1927; diameter 7¼ in.

of this road in mind, the Natomas Company of California left a 400-ft. channel to the north of the bluffs, this channel being made during the dredging of the ground and by means of the side-swinging stacker that had previously been installed for the canal construction. The main river was then turned through the new channel (Fig. 7) and the old channel was then mined and the tailing piled against the bluff. The old river road was then re-established without further cost to the county.

Nature of Gravel Mined

The deposit dredged was mostly loose gravel with very little clay, the bedrock being soft lava and the depth varying from 10 to 50 ft. All of the various deposits mined during the twenty-year period were widely separated, making it necessary in some cases to dig only flotative space across ground of other companies that had already been dredged. Some of these moves were short distances, and others were more than a mile, but the aggregate in twenty years amounted to over eleven miles.

Late in 1916, after the dredge had mined all the ground originally allotted, it was decided to re-dredge some of the tailing of the early-day Risdon type dredge which was not thoroughly mined by that type of dredge for various reasons, and about 200 acres were re-dredged in this operation.[1]

The longest shutdown for repairs during the life of the dredge occurred during 1915, when the wooden gold tables were replaced after nine years of service. A new upper tumbler was also installed at this time and new timbers were put under the screen rollers. The dredge was shut down for five weeks, and this was the only delay of any consequence in the twenty-year period, as repairs were made each "clean-up" day and the dredge kept in first-class condition at all times. On two different occasions the dredge was kept from sinking when a leak in the hull occurred, by the use of a 5-in. vertical centrifugal emergency bilge pump which was direct-connected to a 10-hp. motor. Electrically operated signal bells were attached to floats in each corner of the hull and operated the signal in the winch room, when more than six inches of water accumulated in the hull.

The daily average running time covering the first twenty years' operation was 87 per cent. Total yardage handled during the twenty-year period was 30,316,814 cu.yd., at a cost of less than 3¾c. per cubic yard, which includes taxes and insurance but not depreciation. The total gold that has been recovered so far has been over $2,000,000.

Dredge Sold to Former Employees

On Aug. 14, 1925, after all the ground owned by the Natomas Company of California in the Oroville district had been mined, the dredge was sold to C. H. Thurman, who as superintendent had been in charge of the dredge for seventeen years, and other old employees of the Natomas company. The Thurman Gold Dredging Co. was formed and has since operated the dredge on land which the company purchased from the Yukon Gold Co., 7 miles southwest of Oroville. During 1926 the Thurman Gold Dredging Co. operated the dredge with a stockholder in charge of the winchroom on each eight-hour shift and dredged 1,465,710 cu.yd. in the twelve months, at a cost of 3.25c. per cubic yard, with 86 per cent running time. The present owners expect to mine all their ground and to dismantle the dredge late in 1927.

[1]See *M. & S. P.*, Vol. 118, p. 257, article by C. H. Thurman.

Fig. 9—Dredging difficulties. Digging up a buried sycamore tree in 1926

How to Stake Your Claims in Ontario

By William G. Mick
17 Methuen Ave., Toronto, Canada

William G. Mick

IT IS a well-known fact that the average inexperienced prospector going into the bush for the first time knows very little about the actual staking or laying out of his claims. I recently asked a friend who is thinking of prospecting this year how he would go about staking. His answer was that he would follow some road that was near his claims and then lay out a square around the most likely looking find of mineral. Unfortunately, many beginners do not avail themselves of the proper information, with the result that, if they stake their claims in the wrong way, when these claims are later surveyed trouble is sure to arise.

A mining claim in unsurveyed territory in Ontario must, as nearly as reasonably possible, be squares of 40 acres with 1,320-ft. boundaries running north and south and east and west. In surveyed townships a claim will vary in size according to the subdivisions of the township. A license holder may stake out three 40-acre claims in his name, and three each for the other licensees, in one mining division in one license year.

The first thing the prospector must do to stake a claim properly is to locate one of the officially surveyed boundary lines of the township in which his find of mineral has been made, and then work from this point to his claims, measuring distances by pacing. If one has maps—and certainly one cannot very well go about the business of prospecting without them—he can keep fairly well posted as to the direction in which he is traveling by the topography indicated on his maps.

Humorous as it may seem, I have heard men say in all seriousness that they would locate these lines by following a fence on some other property. The truth is there are no fences, roads, or convenient landmarks in virgin territory. The finding of these lines is the hardest part of staking, and without their proper location one may have trouble later in registering such claims. Or, if the prospector does register what he believes to be the correct location of his claims, he may still be out a considerable distance. In fact, it has been known that some men have staked and registered claims on a certain township only to find later that their claims have been in the next township. This mistake is easily made, especially when one is in virgin territory with very few landmarks by which to get one's bearings.

There is only one way to find a township line, and that is to travel until some line has been located nearest your find of mineral and trace it through by the blazes on the trees. When one finds a line and does not know what township it borders, a consultation with the map one should carry of the district in which one is prospecting will show various landmarks, such as lakes, streams, and other markings. A surveyor's blaze is on three sides of a tree—namely, on the side past which the line runs, on the opposite side, and on the side which the surveyor faces in running the line.

Now, it can be seen that to make sure that the line being followed is the one nearest and bordering on your property a map of some part must be consulted. The ability to show accurately just where your claims are located will save endless trouble when you go to the nearest recording office to record your claims. The recorder has to take your word and sketches of location as his guide in recording claims.

Right here it may be stated that when a party of prospectors is going into the bush it is a good idea to take along some one who knows how to stake claims. The probable trouble saved later will more than pay for such a man's services. Besides, if the party is merely looking for mineral and has no particular finds in view, the presence of an experienced man will be of inestimable value in settling the many problems that crop up in connection with prospecting.

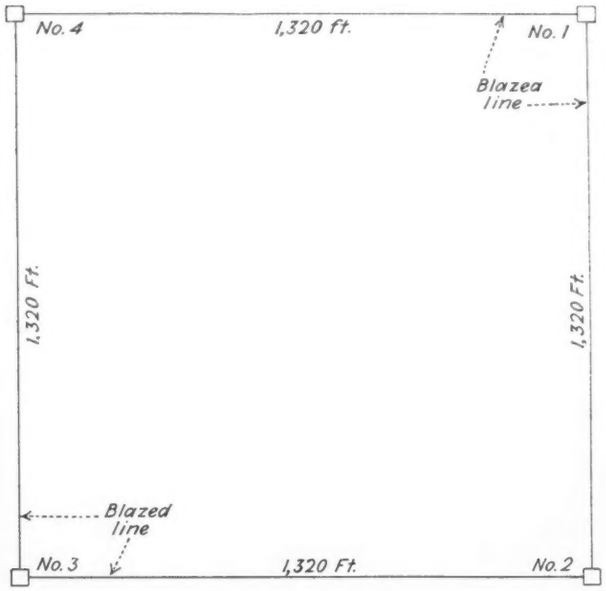
Now, suppose you have found, say, the northeast corner of the township in which you wish to stake claims, and that these claims are at this corner of the township. First drive in a post at this corner. Such posts must be faced smooth on all four sides to at least one foot from the top and must be not less than four feet in height from the surface of the ground. Each side of such posts shall measure at least four inches across when squared or faced. A standing stump or tree may be used as a post if cut off and squared and faced to the correct height and size. If the ground at the point is of such formation as to render the planting or erecting of a post impracticable, the corner may be indicated by planting or erecting at the nearest practicable point a witness post, which must bear the same marking as that prescribed for the corner post at that corner, with the letters "W.P." added and an indication of the direction and distance of the site of the true corner from this witness post.

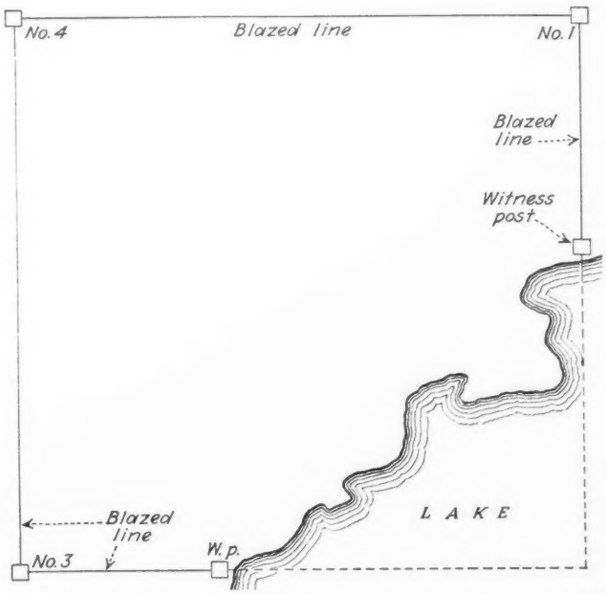
Having erected No. 1 post at the northeast corner of the claim, pace off 1,320 ft. from this post to the southeast corner, and there do the same as was done at No. 1 post. This second stake must be marked No. 2. Then from this stake pace off another 1,320 ft. to the point where you are to erect another post. This will be the southwest corner and is to be designated as No. 3 post. From No. 3 post lay off another 1,320 ft. north to where the fourth post is to be erected. This is the last post to be erected and is known as No. 4 post. From No. 4 post east across to No. 1 post will be another 1,320 ft. When your claim is thus properly laid out you should have a square claim of 40 acres, or one 1,320 ft. on each side.

On No. 1 post the following writing must be placed: the name of the licensee staking out the claim, the letter and number of his license, the date and hour of staking out, and, if the claim is staked out on behalf of another licensee, also the name of the other licensee and the

letter and number of his license. If the claim is situated in a township surveyed into lots, quarter sections, or subdivisions of a section, the part comprising the claim, and the lot and concession or the section by number, must also be given.

The diagram below shows the layout of a 40-acre claim. Where the claim borders on a lake the illustration in the next column shows how the posts are to be





erected. On posts numbered 2, 3, and 4 also must be placed in writing the name of the licensee staking out the claim, and, if the claim is staked out on behalf of another licensee, his name must appear on each of the above-mentioned posts. Remember to place all writing on the side of the post facing the next post in line.

Besides this information which must be placed on each of the four corner posts of a claim, the boundaries of such a claim must be further marked by plainly blazing the trees on two sides only, where there are standing trees, and cutting the underbrush along the boundary lines of the claim.

Where there are not standing trees, the boundary of a claim must be clearly indicated by planting in a straight line from one post to another, durable pickets, not less than 5 ft. in height, and at intervals of not more than 132 ft. If pickets cannot be driven into the ground on account of the rock surface, then piles of earth or rocks must be erected at intervals of 132 ft. These monuments of earth or rock must be not less than 2 ft. in diameter at the base and at least 2 ft. high, so that the lines may be distinctly seen.

The ability to pace off any distance fairly accurately cannot be too strongly emphasized. It would be practically impossible to measure off with a line the distance required between posts. Here is where pacing proves valuable. Many experienced prospectors have acquired such a steady, even stride in pacing that these paced distances are remarkably accurate. Pacing is the initial step taken in laying out a 40-acre claim. The surveyor will later measure off the claim by running straight lines from post to post. That a man is out a few feet in his calculations does not prohibit him from claiming the parcel of land included within his lines. The right is reserved to the Department of Mines to cut down the claim if excessive in size, or to allow such a claim on condition of doing a commensurate amount of work, and paying for the extra area over 40 acres at twice the price per acre.

Now that the necessary preliminary work in the woods has been done, the next step is to go to the nearest recording office as soon as possible after staking and register the claim. This recording gives the first staker prior claim over the ground he has staked, and prohibits any one from claiming his rights to the ground staked.

The above description of laying out a claim refers to staking in the northeast corner of a township. Now, supposing your claims are in the center or southwest corner of a township. To go about the staking of this section you would still be required to find one of the boundary lines of the township, then to follow this line to a point nearest the part where you wish to stake, and then staking, remembering that No. 1 post must always be located at the northeast corner of the intended claim.

At the recorder's office the licensee must furnish the following information; so, to be able to record your claims at once without trouble see that you possess this information before leaving your claims:

An outline sketch or plan of the mining claim, showing the corner posts and the witness posts, if any, and their distance from one another in feet, together with an application—these forms will be supplied you—giving: the name of the licensee by whom the claim was staked out and of the licensee on whose behalf the application is made; the letters and numbers of their licenses; the name, if any, of the claim; and, in the case of unsurveyed territory, its locality indicated by some general description and such other information as will enable the recorder to indicate the claim on his office map.

A license holder must also show his license, and, if he is staking for another party, the latter's license must be shown too.

And, finally, a few weeks before going into the bush, write to the Department of Mines, Toronto, Canada, stating what part you intend to prospect and asking for all the free literature and maps that are available about that particular section. And, don't forget to mention a copy of the Mining Act of Ontario, 1927.

Automatic Substation Control Assures More Economical Operation

Increasing Demands for Power Underground Establish Load Centers Where Manual Attendance Is Undesirable

By Edgar Gealy
Assistant Editor

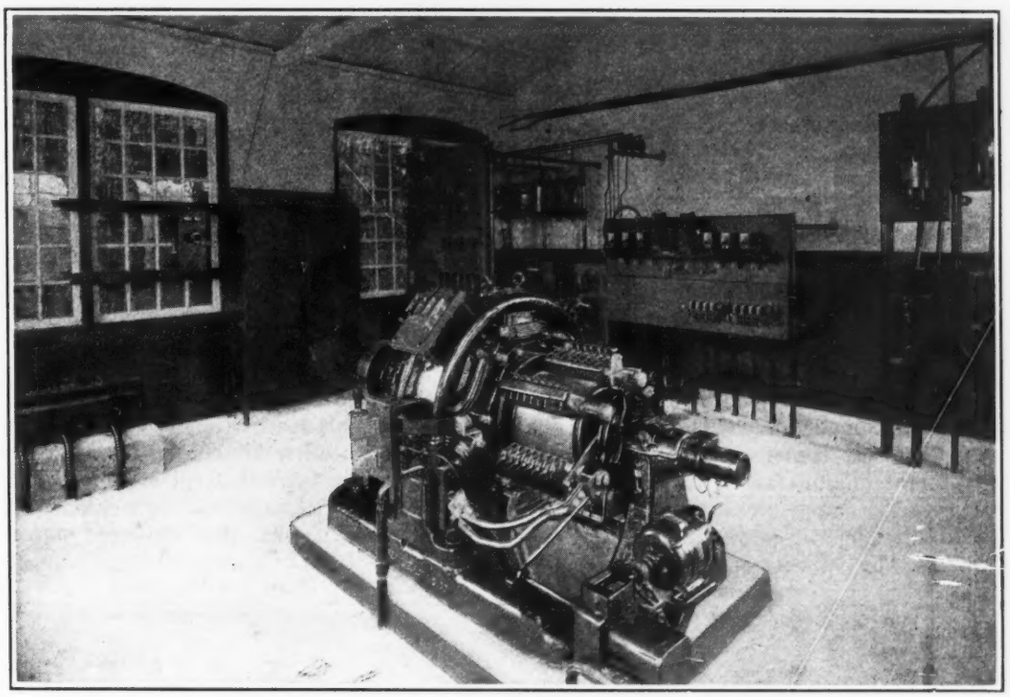
THE many economic, operating, and maintenance advantages of automatic control of power-converting equipment used in metal mining are now so well recognized that adoption of automatic equipment for this service is increasing steadily. When automatic substation control was first introduced to the industry, it was thought by some to have only a limited field of application, because most converting equipment was of small capacity and was placed where it could be readily attended by someone employed to perform other duties. Perhaps this conclusion was based upon the belief that the advantage possessed by automatic equipment was mainly in its ability to eliminate attendance. As many converting outfits could then be located where they could be attended by someone employed for other purposes, the argument for elimination of labor did not have much force. Present conditions are much different, for power-converting apparatus cannot, in most instances, be economically located in a place where men employed to operate other machines can attend them; besides, in those cases where this is still possible automatic control now possesses certain advantages which make it highly desirable and less expensive than manual attendance.

The day is rapidly passing when most power-converting equipment can be located on the surface to the best advantage, where manual attendance can be continued by the services of men regularly employed for other purposes. Already there is a marked tendency to install such equipment inside the mines near the shaft bottom, and before long the movement will be to points still farther inside the mines.

Extensive application of electricity has increased mine power loads. Many new types of machines employed, particularly those used to drive loading machines, conveyors, air compressors, and similar equipment, are driven by direct-current motors. As a result, the quantity of electrical energy used inside the mines is rapidly increasing and the larger power demands are necessitating more and bigger power-converting units. Still more important is the fact that the load centers thus developed are at points far underground where manual attendance cannot be depended on without employing a man for this specific purpose.

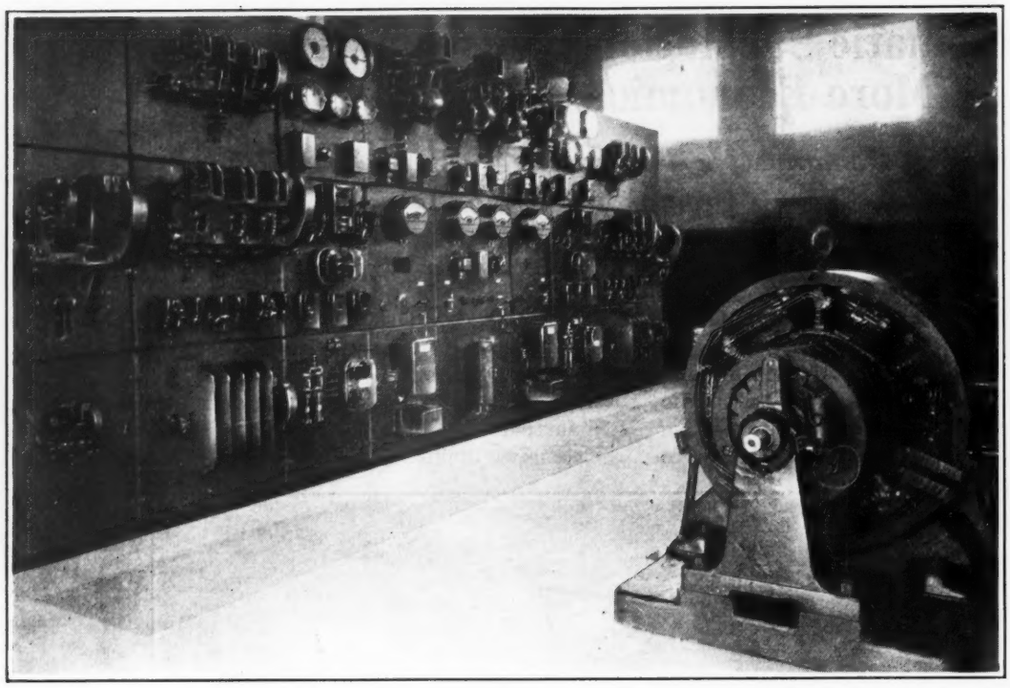
With mechanical loading increasing almost daily, the power load from this source alone suggests the location of power-converting equipment near the working places. Concentrated and intensive mining methods are employed almost everywhere today, with the result that greater tonnages may be loaded and hauled with maximum efficiency. This necessarily has called for increases in haulage facilities and consequently the use of more and larger locomotives.

Most of mine-power systems carrying direct-current



First Automatic Mine Unit

Not many years have passed since this first station was installed, yet the control equipment has been greatly improved. This station is still giving fine operating service without any workmen being nearer than half a mile away.

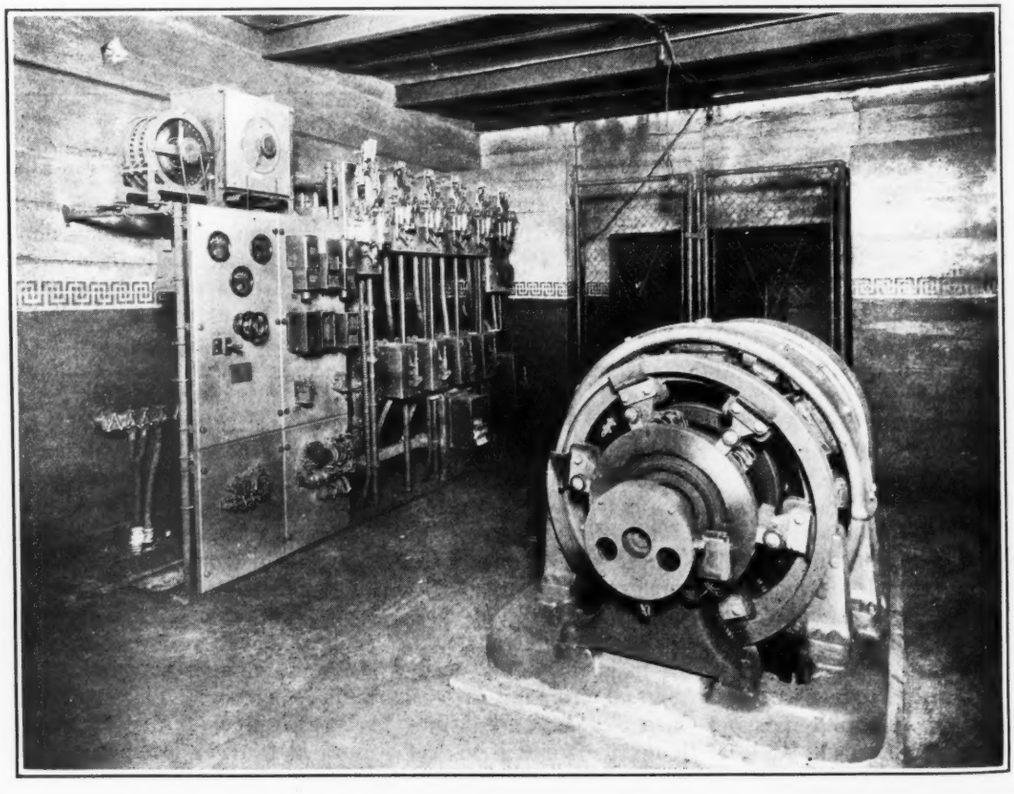


Duplicate panels

Single- or double-unit stations with many intricate operating problems have now been solved by automatic relays, switches, regulators, and thermostats.

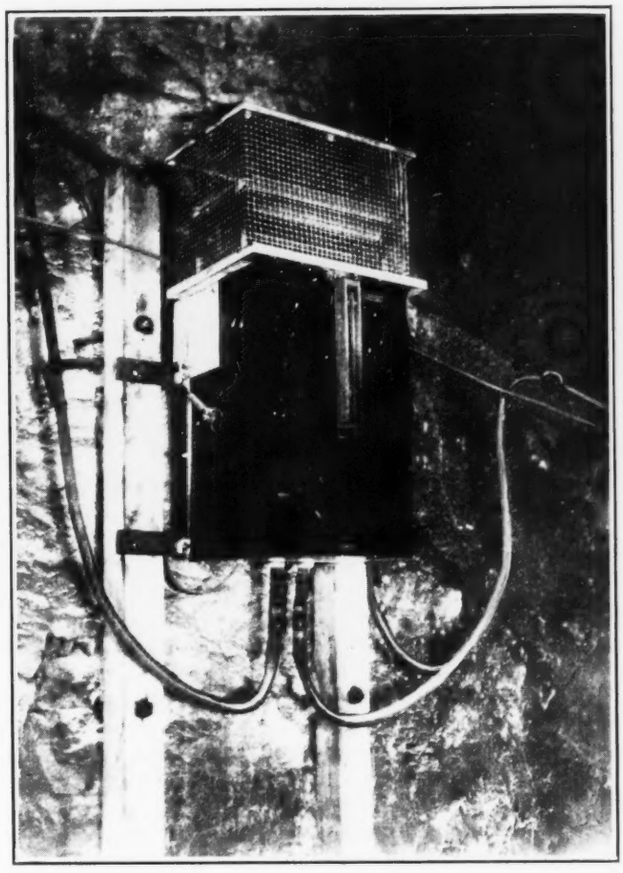
energy use 250 volts. This voltage is relatively low, and even a small drop of potential is a large percentage reduction. Economic power distribution for heavy loads long distances from the source of energy may be obtained at such a low operating voltage only by the use of excessively large conductors. If power-converting substations are located near load centers, the distances to the loads are made much shorter and less copper is necessary in the feeder system. Automatic substation control is a major factor in making this possible.

The ideal location of power-converting substations is at the load centers. The capacity of such units should be properly related to the load at these points. Arrangement of converting capacity in this manner insures high average line and feeder voltage, low distribution losses, and low first cost in feeder copper. Manually operated stations are practically impossible under such a plan because it introduces the necessity of a man employed in many instances to do nothing except attend the equipment. Generally, load centers are some distance from other kinds of machinery requiring manual attendance. When large-capacity converting units are arbitrarily located at convenient points, costly feeders must be installed, or large power losses will exist in the lines. A more serious difficulty with such



Down at a load center

A pushbutton outside the wire gate will start this unit, and stop, and parallel it without anyone entering the room.



Ideal protection with the minimum of lost time is provided by this automatic reclosing circuit breaker in a lead mine. Incidentally, the photograph was obtained by playing a carbide mine light on the apparatus and exposing the film for a long period. Though a workman performs other duties near by, this outfit is operated automatically

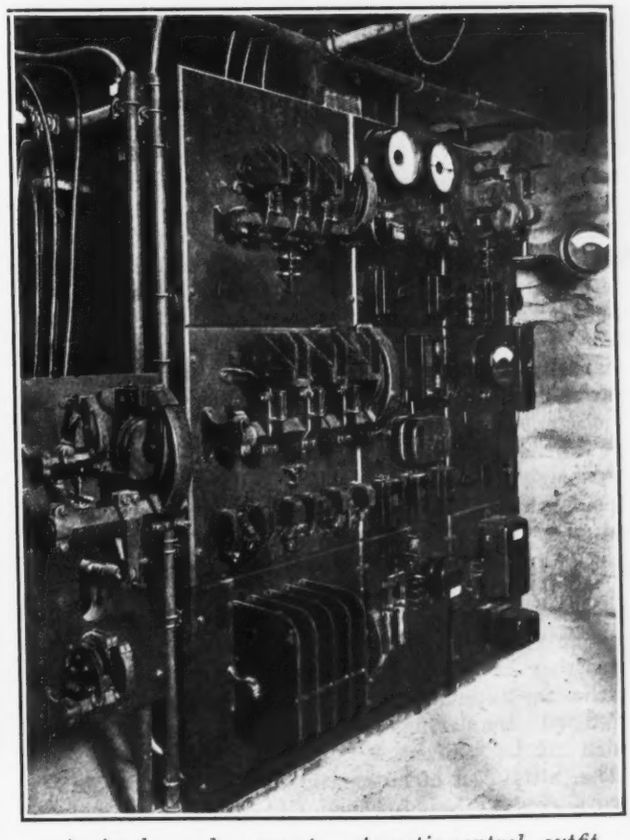
an arrangement is the greater maintenance cost to keep driven equipment in repair and the reduction in operating speed experienced at all times. In the coal industry the recent development and use of equipment drawing its energy from near-by storage-battery power trucks has demonstrated forcibly the advantages of good voltage.

Operating costs are increased and mine output is curtailed by the slowing up of motors when they receive less than their normal voltage. The effect of low voltage on locomotives shows itself principally in high maintenance costs, caused by overheating and burning out of armature and field windings. The experience of one mining company in this respect is interesting. This company was operating twenty-one locomotives, and the mine captain had made a request for two more locomotives costing approximately $10,000. Investigation showed that the voltage regulation inside the mine was bad, though perhaps no worse than in many other mines. However, before buying the new locomotives, arrangements were made to better the voltage regulation at the most distant points of the mine. The results were surprising. All the twenty-one locomotives at once operated better and traveled faster and cost less to maintain. Better tonnage records were established and the two extra locomotives have not been purchased yet.

Automatic substation control equipment has proved itself economically advantageous even where manual attendance could easily be provided at little or no additional cost. With manually operated equipment the human element must always be considered. Anyone who has ever driven an automobile and has found himself in second gear or even in reverse when he thought he was in first, or third, knows that even an experienced attendant may make a mistake in starting, stopping, or paralleling a power-converting unit. The result of such mistakes as failing to put the machine on the running taps, lowering the brushes. adjusting the voltage, and other errors of omission and commission are sometimes just as effective as throwing a monkey wrench in a gear box.

Automatically controlled electrical equipment detects and anticipates trouble before it occurs. It prevents many delays to service, assures proper starting and stopping, and provides adequate protection during the operating period. The positive and automatic operation of various types of protective, checking, and detective equipment has proved the desirability of eliminating manual attendance even when it can be had without expense. When manual attendance is provided, dangerous and improper operating conditions frequently arise which normally cannot be or seldom are detected until serious damage and delay have resulted. Automatic equipment detects such conditions as soon as they occur and either corrects them or sends out a message revealing the difficulty.

Savings in time accomplished by automatic equipment have also convinced many users of the benefits of this method of control. A delay to service always demoralizes inside operations, and frequently extended



A simple and compact automatic-control outfit
Every important protective feature is provided. It involves little more equipment than manually operated panels.

delays result in more losses of tonnage and wages caused by idleness than the additional cost of automatic equipment, over that for manual controls, would entail. When equipment is manually controlled and a circuit breaker is opened, the attendant usually knows nothing about what caused the interruption. If he closes the circuit breaker, he may apply the power just when a man or an animal is in contact with the underground circuit. To close the circuit prematurely may even cause a fire or damage motors driving important equipment which cannot withstand full live voltage when being started. Yet if the attendant fails to restore service promptly to the lines under other conditions, the delay thus suffered, though lasting only a few minutes, may result in the aggregate to an astonishing figure when reduced to a man-hour basis. Generally, when the power supply fails it is a signal for all workmen to stop work, whether or not they be directly dependent upon a machine or light necessary to the performance of their labor. Furthermore, as mining companies resort more and more to machinery to obtain big tonnages, large investments must be made in equipment, and unless the machines comprising the newer equipment are kept in operation as continuously as possible, they fail to earn a profit or even to pay the interest on the investment involved.

Every effort must be made today to attain the most satisfactory performance from every piece of equipment, and when this can be accomplished, along with other advantages, including those providing less abuse and better protection, such as are assured by automatic control for power-converting apparatus, there is every inducement to adopt the most approved modern practice.

One of the most unsound arguments against the use of automatic equipment advanced by a few persons not yet conscious of the enormous strides made by the industry in general is that a "pensioner" is given the job of manually attending apparatus which can be made automatic. The argument condemns itself, because if a man is a "pensioner" his ability to perform the normal duties of a worker is limited. He is, therefore, a serious risk to his company and a danger to himself among electrically operated equipment of the revolving type, such as a motor-generator set or rotary converter. Furthermore, such a man generally knows nothing about electrical apparatus and therefore cannot detect many signs of trouble until something serious happens. His incapacity and inexperience will in many instances prevent him from doing the right thing at the proper time and lead him to do the wrong thing too frequently. One mishap resulting in a claim for compensation or damage to a machine may more than pay the usual pension paid non-workers. The power-converting substation is the heart of the whole inside workings of a mine; when it stops almost everything is idle.

The trend of industry today is definitely toward more and more automatic equipment. Many companies are figuring on various forms of automatic apparatus because they have found that the extra cost involved in purchasing automatic apparatus is insignificant compared with the savings in labor and maintenance costs which can be realized.

The initial cost of automatic substation apparatus is always greater than for manually operated equipment. However, it is not so much higher for synchronous motor-generator set equipment, being approximately 30 to 50 per cent more. Synchronous converter apparatus costs on the average between 60 to 80 per cent more when supplied with automatic features than when furnished for manual control. In either instance, this additional cost compares favorably with the yearly salary of attendants, especially when more than one shift of workmen is required.

Quitting Miner Held Underground Until End of Shift

By Leo T. Parker
Attorney at Law, Cincinnati, Ohio

One of the most complex legal questions involves the refusal of an employer to supply means by which an unruly miner may leave a mine. The leading case on the subject is Herd vs. Weardale Steel Co., et al. (1915), A. C. 67. In this instance a miner was employed under verbal contract by which it was agreed that either employer or employee might terminate the service upon giving the other fifteen days' notice. The mine was entered by means of a shaft in which the men were lowered and raised by two cages operated in balance. Operations were conducted on three shifts of seven hours and ten minutes each. At 9.30 o'clock one morning the shift went down. Immediately after descending, one of the men was directed by a foreman to do certain work which the workman believed to be unsafe. He refused to do it and demanded that he be allowed to go to the surface on the cage. Permission was refused, the rule being that the cage could not be used until the shifts were ended. Several times the cage came down and was used for hoisting material. Moreover, it so happened that when men at the top were about to come down and the cage at the bottom of the shaft was empty and available for hoisting men, the miner got on the cage and refused to leave when ordered out. Acting upon orders received from the manager, the foreman kept the cage stationary in the shaft for a considerable period, refusing to let it ascend with the workman in it. The employee brought action against the mine owner for damage on the grounds of false imprisonment, since he had been detained in the mine against his will.

However, the court held the mine owner *not* liable for damages, and in a lengthy opinion said in part:

"By the law of this country no man can be restrained of his liberty without authority in law. . . . If a man chooses to go into a dangerous place at the bottom of a quarry or the bottom of a mine, from which by the nature of physical circumstances he cannot escape, it does not follow that he can compel the owner to bring him out of it. The owner may or may not be under a duty arising from circumstances, the neglect of which may possibly involve him in a criminal charge or a civil liability. . . . In this case the workman refused to work; it may have been for bad reasons—I do not think that question concerns us. He said that the work he had been ordered to do was of a kind that was dangerous, and he threw down his tools and desired to come up to the surface. The manager, or at any rate the person responsible for the control of the cage, said: 'No, you have chosen to come at a time which is not your proper time, and although there is the cage standing empty we will not bring you up in it,' and the workman was in consequence under the necessity of remaining at the bottom of the shaft. There was no refusal to bring him up at the ordinary time; but there was a refusal—and I am quite ready to assume that the motive of it was to punish him, I will assume it for the sake of argument, for having refused to go on with his work—by refusing to bring him up at the moment when he claimed the right to come."

Discussion

The Need for Research

THE EDITOR:

Sir—In your editorial columns of May 28, 1927, you wisely and forcefully point out the urgent need of an intelligent understanding of the way rock masses behave under varying conditions of stress and strain, natural or induced by mining operations, before much more can be done to eliminate one of the hazards of underground mining, the collapse of mine workings. With your views I have the utmost sympathy. Until a comprehensive program of research has been outlined and consistently followed, the slogan "Stop, look, and listen! the roof is going to fall" may command the attention of those who labor underground, but the invitation to take five off will be gladly accepted. The announcement is unnerving, but if the roof doesn't fall the purpose of the slogan will be defeated and greater carelessness result.

The science of petrodynamics is in its infancy. I predict its vigorous growth and widespread usefulness: it needs fostering, development, and encouragement, for which it will in the future yield abundant return. With it, all phases of mining technique are inalienably connected, and as it takes mature form it will vest itself with clothes of safety and economies, and give birth to other mining enterprises little dreamed of today. "The roof is going to fall!" Why? To answer this inquiry intelligently will be a great contribution to mining.

We must write the alphabet of petrodynamics as indeed we should of all technology. Caving practices have been developed, which under favorable physical conditions of rock masses have made possible exceedingly low mining costs; for example, the truly great accomplishment of Maclennan at Miami. But if we know why, when and how the roof will fall, we can invite and control the collapse, and improve or expand caving methods. Dr. Stoek, of Illinois; Dr. Kotze, of South Africa; George S. Rice, of Washington; Moulton, Cates, and McNair, have pointed the path. Dr. Crane's study of the Alabama iron ores is a great contribution. Harley's illuminating suggestions on the Morenci ores, the work of the committee on ground subsidence of the A.I.M.E. —these and others are pioneering in a fascinating and fruitful field, and from the research growing out of their initial investigations the slogan "The roof is going to fall" will have a different significance; it will be an exultation in orderly accomplishment, not a fearsome warning of impending accident. Quoting you, "It is a wonderful problem for skillful research."

I would like to connect your editorial with the news from Washington in the same issue, referring to a reorganization of the Bureau of Mines, and to voice a protest to the implied subordination of research activities to the economic division of the Bureau. I wholeheartedly endorse the program of mineral economies: under C. P. White, sound analysis of statistical data of all kinds will be made available, and market conditions, the utilization of minerals, elimination of waste, and standardization and simplification of practices will result and the industry be enriched thereby; but while the shadow may loom larger than the substance, the tangibility of the substance is of first consequence. The scientific and technologic branches of the Bureau of Mines have not been fully appreciated by the people; the conscientious and competent efforts of the research workers have contributed more to the dividends of mining companies and to the expansion of the mineral industry than any other governmental bureau.

Flotation revolutionized base-metal concentration, but without the painstaking research of such men as Coghill, Head, Tucker, Fahrenwald, Ralston, and others, into the physical and chemical laws underlying the practices, many mining balance sheets would be written in red ink. Undoubtedly "the roof will fall" if these props or pillars are weakened by the diversion of funds to foster projects which serve as talking points for special appropriations, salable issues in Congress but more or less inconsequential to the mining industry.

Many beneficial and direct applications of pure science to metallurgy might be cited, and I hope opportunity will be given some champion of research activity of the Bureau of Mines to review some of the accomplishments of the last few years, in the columns of the *E. & M. J.* The investigation of the smelter-smoke problem has been far-reaching in its influence; the changes in milling practices in the Tri-State zinc district are an outgrowth of basic study of ore dressing; the Fahrenwald hindered-settling devices, the hydrometallurgical work of the Tucson station, the recently completed studies of the thermal properties of oxygen and nitrogen giving the equivalent of steam-table diagrams, the exhaustive analysis of rotary kiln roasting, to mention but a few of the contributions immediately measureable by the yardstick of dollars and cents, should rouse the operators to action in testimony of blessings received and others hoped for. An "economy program" is commendable, retrenchment of activity in abstruse lines of investigation may be expedient, but a "penny wise, pound foolish" policy would be disastrous. Safety will result, economies will follow, when we mine, mill, and smelt with understanding and certain knowledge. The light of science will illumine the darkness of the underground, the warmth of the lamp of knowledge will resolve many a complex mineral into its desired components.

Stop, look, listen!

FRANK H. PROBERT,
Dean, College of Mining, University of California.
Berkeley, Calif.

Effect of Sulphite in Flotation

THE EDITOR:

Sir—In Mr. Gieser's paper, "Flotation Reagents and Practice," appearing in your issue of May 21, the statement appears that "too much sulphite inhibits everything from floating." Similar statements have recently been made in several other articles on flotation practice.

Our experience with sodium sulphite as a zinc and pyrite depressant has been rather extensive, as in our mills at Midvale, working on widely different ores, we

use this reagent as our standard zinc depressant. This is also true of all our flotation tests in the laboratory, where we use sulphite at the rate of from one to three pounds per ton of ore. In no case have we found that increased sulphite has any retarding effect upon galena. At times, as a matter of interest, we have used as high as 75 lb. of reagent per ton of ore in the laboratory, finding that it in no way hurt the lead grade and recovery.

To prove definitely that a large excess of sodium sulphite has no retarding effect on galena, we recently made a test on a Utah lead-zinc-pyrite ore, using sulphite at the rate of 500 lb. per ton ore. Flotation rates of the lead, zinc, and pyrite products were as fast as when using only 1.5 lb. sulphite per ton. No cleaning of concentrates was done in this test. The feed and products assayed as follows:

	Ounces Per Ton	Per Cent		
	Ag	Pb	Fe	Zn
Feed	4.5	8.6	11.5	9.9
Lead concentrate	30.0	66.0	8.8	2.2
Zinc concentrate	2.0	3.2	8.6	2.2
Pyrite concentrate	0.6	0.8	43.8	0.9
Tailing	0.5	0.8	15.2	1.0

Certainly there was no inhibiting effect upon the galena here, it being the first mineral floated. The sphalerite did not start to float until copper sulphate had been introduced into the flotation circuit.

Midvale, Utah. R. A. PALLANCH,
Metallurgist, U. S. S. R. & M. Co.

Hydraulic Miners Need Organization

THE EDITOR:

Sir—I read in the *Engineering and Mining Journal* of May 28 that the "Hydraulic Miners in California Were Disappointed." I do not see how they could be disappointed, and why they did not get just what they deserved, for at the meetings in the legislature at Sacramento it was plain that the farmers were perfectly organized, whereas the miners were not. However, the legislators were wise enough to understand that there was no real fight between farmers and miners and that all the proceedings were for "political ends"; so the Cloudman bill was endorsed.

After this endorsement the bill was sent to the Finance Committee and during the last week of the legislature its consideration was taken up by the committee. I was called to Sacramento, in case my testimony would be of value, and found that the committee was overloaded with bills and that the date had been postponed from Monday to Tuesday. Having nothing to do, I took several walks about the beautiful grounds of the Capitol, admired the new state buildings around it, and saw on the frontispiece of one an inscription reading as follows: "Bring Me Men to Match My Mountains." This brought me back to the days of '49 when only men of this caliber were in California, a gun in one hand and a shovel in the other—ready to fight and to dig. I said to myself, "Here we are, but in this civilized state the farmer will replace the gun by the plow and the miner will add to his shovel the modern tools; both will work together and co-operate toward the welfare of California, one digging the treasures in the depths of its mountains and the other harvesting the crops on its plains." Really, I was very much impressed by the inscription and thought that if miners and farmers would read it they would understand the meaning of it.

As I was killing time, I bought a newspaper published the same morning and read an article referring to a letter from the Governor to the Finance Committee, calling its attention to the fact that during the last legislature, under the previous governor, nothing had been done about the payment of certain claims aggregating around $16,000,000 and that he was desirous that the committee take the matter under consideration before making new appropriations. As far as I remember, those millions were due as payments for damages resulting from the hydraulic mining of long ago.

I immediately concluded that the letter had been sent at the right moment for putting spokes in the wheel of the Cloudman bill. The next morning (Tuesday) I attended the meeting of the Finance Committee and listened to the consideration of several appropriations before the Cloudman bill was called for discussion. Then the chairman took his watch out and said: "Gentlemen, we have not very much time to spare on this bill. I will give ten minutes to each side to present and discuss and the committee will take the balance of the time for consideration."

Mr. Cloudman arose and in ten minutes explained why he proposed the bill and what was to be expected of it. Mr. Ellis, upon the other hand, took also ten minutes explaining why he opposed the bill, without forgetting to read the contents of the newspaper published the day before in which the committee was asked to liquidate the past before making new appropriations. Following him, Mr. Develin, a remarkable lawyer retained by the farming interests, read part of a decision of the courts on the legislature, I do not know which, and Mr. Steward completed the reading, which altered the conclusion. I had been called upon to explain hydraulic mines and their proposed operation under modern conditions, but the time was up and before I could say anything the chairman said: "The gentlemen who do not belong to the committee are requested to step out." And this we did, knowing well that no appropriation would be granted.

Later on the sponsors of the bill decided to take it direct to the floor of the Senate, the next day or day after. Then it was whispered, right or wrong, that if the bill was adopted by the Senate it would be vetoed by the Governor. It was defeated by one vote.

This decision should be a lesson to the miners; they should see that without organization nothing can be accomplished. The resumption of hydraulic mining where it is prohibited should be effected by education and not by fighting. The farmers and the miners should get together in the real spirit of co-operation and not in opposition; they should be shown that one industry helps the other, that the development of mines will help to solve some of the farmers' problems; they should see that the gold production is on the decline and that gold, being the basis of exchange, should not decrease in production to the danger point. The only way to prevent this is by the opening of new or the reopening of old mines, provided no injury is done either to the farmer or to the streams. When these ideas are established in the minds of the interested parties it is certain that hydraulic mining will be resumed and that a new era of prosperity will prevail in California.

Where are the men willing to tackle this job? Who are the organizations willing to make a study of this problem, and when I say organizations I mean manufacturers, bankers, farmers, miners, lawyers—anybody but politicians. When this is done and conclusions are reached, hydraulic mining, instead of being taboo, will bring forth new wealth for all. P. BOUERY.

San Francisco.

News of the Week

Summary

IT IS THOUGHT that an increase in the duty on magnesite is indicated by the information contained in a report of the U. S. Tariff Commission which will be sent to the President in the near future.

Australian copper producers submit further evidence for a bounty to the commonwealth tariff board. A decision in the matter by the courts has not as yet been announced.

Construction of the Horne smelter, equipping of the Horne mine, and the development of the Noranda townsite exceed estimates made to cover the work.

The labor problem at Mount Isa appears to have been one of the factors responsible for the Anglo-American Corporation not exercising its option on the property.

Five parties are sent into the field in British Columbia by the Geological Survey of Canada.

Recognizing that the Soviet Government is not disposed to return its concessions, the Russo-Asiatic Consolidated reorganizes its finances and purchases lead-zinc-silver properties in southern France.

Accident frequency and severity decrease in the Tri-State district. The number of man-shifts increases 76.5 per cent in two years, whereas the number of accidents increases only 53 per cent.

Labor conditions in the Michigan copper district improve, and the underground forces at the mines increase as a result of the influx of workers.

By a decision of the Circuit Court of Appeals the Boylan patent for improvement in separating ore pulp is found not infringed by the Wood process.

Mount Morgan Gold Mining Co. permanently suspends operations and will liquidate.

Increase in Duty on Magnesite Indicated

U. S. Tariff Commission's Report Shows Cost of Production Has Been Found to Be Considerably Higher in the United States Than in Competing Countries

By Paul Wooton
Special Washington Correspondent

AN INCREASE in the duty on magnesite is thought to be indicated by the information contained in a report of the U. S. Tariff Commission. The report will go to the President in the very near future.

Judging from the facts which have been developed, it seems certain that the commission has found that the cost of production in the United States is considerably higher than in competing countries. The present duty is ⅝c. per pound on caustic magnesite and 3/16c. per pound on crude magnesite.

Imports have been coming in freely under these duties. About 40 per cent of the domestic consumption is now being supplied from foreign sources, the chief of which is British India. The principal market for caustic calcined magnesite is east of the Mississippi River, while domestic production is confined to the Pacific Coast. Freight rates therefore constitute an important factor in the consideration of this case. Transportation charges on the imported material at New York are much less than those on shipments from domestic mines to that port. The Attorney General has ruled that transportation charges to the principal market must be included in these cost comparisons.

The domestic production of grades of magnesite suitable for caustic products went as high as 55,000 tons during the war. The output increased to 70,000 tons in 1923 and in 1926 was 54,000 tons.

In view of what has happened in various instances when the rates of duty have been increased, it is not certain that an increase in the magnesite duties will stimulate domestic production. Some of the foreign industries have a sufficient margin of profit to absorb any increase of duty permitted under the flexible provisions of the act, with the result that prices for the imported material are not advanced.

A public hearing on fluorspar, to take place in Washington July 22, has been ordered by the Tariff Commission. In connection with the announcement the commission made public a report covering its studies of costs of production and other factors which must enter into the consideration of the application for an increase in the duty.

The data in the report were gathered by Myron R. Walker, one of the commission's mining engineers. It is shown, among other things, that the domestic cost of producing lump fluorspar was $14.74 per short ton in 1925, whereas in South Africa, the foreign source of the greatest quantity of those imports, the cost was $13.96, invoices show. Gravel fluorspar costs $20.66 a ton to produce here, whereas the comparable cost in Great Britain appears to be only $7.43. The ground ceramic grade costs $25.38 a ton to produce in the United States. In Germany this grade is produced at a cost of $18.81.

The domestic lump spar is used entirely for metallurgical purposes, whereas all the imported lump is of acid grade. Thus the two are not strictly comparable. The other grades, however, offer comparisons of like articles.

At the hearing the commission expects to establish, among other things, whether the domestic reserves of high-grade spar for acid and ceramic use are sufficient to supply present and future demands at present prices; whether 1925 is a representative year for the purpose of price comparison; whether there are substantial differences in the calcium fluoride content of domestic and imported spar; whether invoice prices are to be considered to include interest on investment, selling expense and profit; whether the different spars should be classified separately for tariff purposes.

Mr Walker's report, which is available for distribution to those interested, is exhaustive. It covers fifty-two typewritten pages. Some of the subheads are: Uses, methods of production, world production, imports, exports, competing countries, wholesale prices, domestic consumption, cost of mining, cost of waste sorting, selling cost, other cost items, foreign costs, competitive conditions, transportation and delivered costs.

Quincy Mine Sends Thirty-five Tons Mass Copper to Smelter

Labor Conditions Improve in the District—Calumet & Hecla Now Employing 4,700 Men

In the 88 level No. 2 shaft Quincy mine, in the Michigan copper district, in which the new east lode was recently cut, the vein has been opened 70 ft. It is decidedly rich in copper content, even more heavily mineralized than in the two levels above. It is apparent that the lode is becoming better with depth. The development of the east vein is equivalent to the opening of a new mine for Quincy on account of the richness and possibilities of the lode. A loading chute to the 89 or bottom level is being put in and will be ready in two weeks. It is expected that the east lode also will be cut in that level, which will give an additional 100 ft. on the vein. Stoping in the east lode is under way in the 86 level, in which the vein was first found to be mineralized. The rock being mined is heavy in stamp copper. In the 87 level drifting on the east lode is proceeding in conjunction with the regular development of the main vein. In the 88 the crosscut has not yet reached the main lode, but it is expected it will be found as uniformly mineralized as in all levels above. The values in the main formation in the 87 level are very satisfactory.

In No. 6 shaft miners are taking out the last of one of the largest copper masses ever found in the lower workings. Thirty-five tons of the metal has been brought to surface and sent to the smelter. The reopening of No. 8 shaft is being discussed and repairs in this unit may be started in the near future. The shaft has been idle for some time and considerable repairs may be necessary.

An issue of treasury stock by Quincy has been talked of, but no decision has been reached. Quincy's situation now is no different than it has been for several years. The company is capitalized at 150,000 shares with a par alue of $25 per share. A total of 110,000 shares has been issued, leaving 40,000 in the treasury.

Labor conditions in the district continue to improve as the season advances, and underground forces at the mines are mounting steadily as the result of an influx of workers. Calumet & Hecla Consolidated is employing 4,700 men, as compared with 4,200 a year ago, and there is a prospect that the number will exceed 5,000 by late fall. Former mine employees are returning from distant points, attracted by reports of favorable conditions. The farming regions are also contributing to employment, and at the end of the planting season large numbers are expected to return to the mines.

Mount Morgan Company to Liquidate

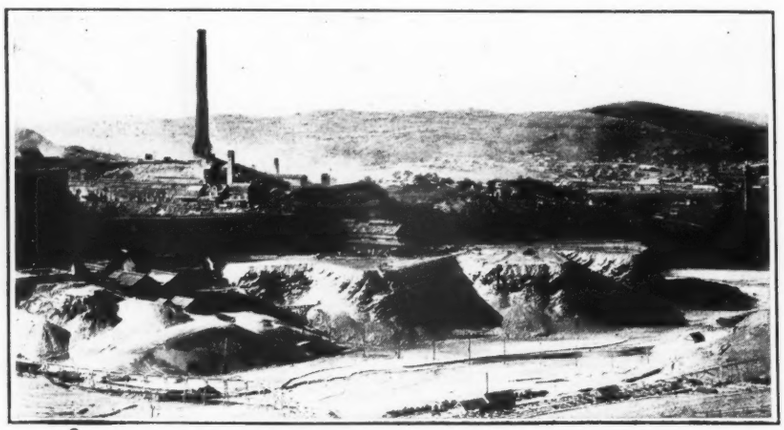
PERMANENT SUSPENSION of operations at Mount Morgan and the liquidation of the Mount Morgan Gold Mining Co. are said to be planned. The formal decision to this effect is expected to be made at a special meeting of stockholders which will be held soon.

An installment of $3.25 per share of the unpaid subscriptions to the capital stock of the Rhode Island Copper Co. has been levied for the purpose of paying the company's debts and closing up its affairs. The assessment is payable June 27 by stockholders of record June 25. The company owns 800 acres immediately north of the Franklin Junior mine. This area carries a number of amygdaloid and conglomerate beds, none of which was found to carry values in commercial quantity. The property was opened by three shafts sunk in the Pewabic bed.

Operations Expand in the Bay Horse District

The Livingston mine, in the Bay Horse district, Custer County, Idaho, has increased its mill capacity to 400 tons daily. The silver-lead shipping ore and concentrates are sent to Salt Lake City for smelting.

The Idaho Hermit Mines, Inc., a New York company, has purchased the Hermit Smith properties, adjoining the Livingston and lying between this mine and the Silver Rule, at one time a producer of high-grade silver-lead ore with a record of more than $800,000 output. The Idaho Hermit properties are developed by several shafts and by two crosscut tunnels. High-grade silver-gold-lead ore was shipped from the development work, which will be continued this summer.



The copper reduction works of the Mount Morgan Gold Mining Co., Ltd., near Rockhampton, Queensland, Australia

United Verde Fire in Jerome District Burns On

Calumet & Arizona to Develop the Hiltano Claims—Miner Killed in Bisbee Queen Shaft

The fire in the United Verde Copper Co.'s mine has celebrated its twentieth birthday. Thousands of dollars have been spent by the company and numerous methods have been used to quench the fire, which has made the mine a veritable volcano. Forcing live steam into the hillside and bulkheading with concrete have been of no avail. Finally steam shovels were used to remove the overburden and expose the fire area. Hundreds of thousands of tons of rock were removed, but the zone of fire kept pace with the shovels. The sulphur continues to unite with the oxygen of the air, and the mountainside presents a picture worthy of Dante's pen. The company has decided to abandon its fire fighting, having discovered that the oxidation of the sulphide leaves the ore in better condition for smelting, as it eliminates the process of roasting. The blasting to loosen the hillside for the steam shovels has created fissures and fractures in the rock which let in the air and allow the fire to spread. The fire causes a great deal of heat in the underground workings and makes necessary a complicated system of bulkheads and fans to provide proper ventilation.

Preparations have been started for an extensive development campaign on the Hiltano lead-silver claims in Pima County, which have recently been acquired by the Calumet & Arizona Mining Co. There are several shafts on the property, including the Gopher, 49, and Chief. Material and equipment for carrying on development in all these shafts are on the ground. A water supply has been provided.

Oscar Lewis, a miner employed at the Bisbee Queen shaft near Warren, Ariz., was recently killed. Two 13-in. bolts fell into the shaft where he was working, one of them striking him on the head. The accident occurred when sinking operations at the Bisbee Queen were nearly completed. The goal of the 800-ft. level has nearly been reached after two and one-half months of record-breaking work in which the men have established a daily average of 7½ ft.

Park Galena Plans Many Improvements

Ten feet of good ore has been opened up on the 400 level of the Park Galena Mining Co.'s property, formerly known as the old Glencoe mine, situated on the east side of the Park City, Utah, district. The ore has been followed continuously for 100 ft., and the last 50 ft. of the deposit has averaged from 10 to 11 ft. wide.

The property is developed by a 1,500 ft. tunnel. Building of a half mile of road to connect the mine with the county road is under way. The hoist is to be electrified and a loading station is to be erected on the railroad about one mile distant. Since starting operations in September the company has shipped 30 carloads of ore.

Wood Process Decreed Not to Infringe Boylan Patent

Appellate Court Renders Decision—Similarities in the Two Cones Declared Old in Art

The U. S. Circuit Court of Appeals in the case of Charles E. Wood, defendant-appellant, vs. Samuel H. Boylan and Ore Reclamation Co., plaintiffs-appellees, has found the Boylan patent, No. 1,326,908, to be for a narrow improvement in the old art of separating or "classifying" ore pulp or sludge, and because of its narrow scope it was held not to be infringed. The final portion of the court's opinion follows:

"Compared with appellant's device, as to these cardinal features of suspension of the cone and number of valve operating parts, there appears quite a difference. As to the suspension, the difference has been well likened, by counsel, to that between a yardarm scale and a platform scale. Boylan's entire device is suspended from a single horizontal lever resting medially upon a single knife-edge support. From one end of this lever, the cone freely hangs; to the other end is movably attached the long lever which extends downward to the outward end of the valve lever. The counterweight which controls the action of the cone is placed on the supporting lever toward the end opposite that to which the cone is attached; appellant's suspension is made up of three connected units—the cone, the rigid supports and the member connecting those two. Appellant's cone is rigidly attached to a square frame placed somewhat below the upper edge of the cone.

"The cone frame is suspended on four C-shaped clevises—the upper inside surface of the clevises resting on the knife-edge bearings on the rods connecting the rocker arms and the lower inside surface of clevises supporting the knife-edges on the projecting ends of the cone frame. From the above description of the two devices, it is seen that the method of support is very different in the two devices. In Boylan, there are very few suspension parts and the entire suspension is from above. In Wood, the entire suspension is from below and is made up of three distinct units, each, in turn, composed of several parts. Also, Boylan's cone may vary its position horizontally rather freely while Wood's cone has practically no lateral motion. Boylan's may tilt, Wood's cannot.

"As to valve operating parts, consideration of the two devices will at once suggest the wide difference between the very few used by Boylan and the many used by Wood. Besides the one supporting knife-edge, Boylan has but four points of frictional movement. Wood has 15, including 12 knife-edge contacts.

"About the only similarities between the two are that each releases the solid matter by a valve controlled by the varying weight of the loaded cone influenced by counterweights—all of which were old in the art.

"We think the decree should be reversed with instructions to set the decree aside and enter decree for defendants below. It is so ordered."

Accident Frequency and Severity Decrease in Tri-State Field

According to statistics, the twenty-five mining companies reporting their accidents to the Tri-State Zinc & Lead Ore Producers' Association had 27.8 per cent less "time lost" due to accidents in 1926 than the eighteen companies reporting in 1925 and 49.5 per cent less "time lost" than the eighteen companies reporting in 1924. The number of man-shifts worked by those companies in 1926 was 22 per cent greater than in 1925 and 76.5 per cent greater than in 1924; whereas the number of accidents was only 11 per cent greater in 1926 than in 1925 and only 53 per cent greater in 1926 than in 1924. The fatalities, however, increased more than 100 per cent in 1926 as compared with 1924. The following table gives these statistics in detail:

	1924	1925	1926
Number of companies.	18	18	25
Number of mills running	57	89	116
Number of man-shifts worked	1,041,554	1,507,457	1,837,761
Number of fatalities	10	6	21
Total number of accidents	2,938	4,071	4,491
Shifts lost due to accidents	28,154	28,735	25,398
Accident frequency*	2.82	2.69	2.44
Accident severity†	27.2	19.1	13.8

*Number of accidents per 1,000 man-shifts worked.
†Shifts lost due to accidents per 1,000 man-shifts worked.

Explorations From No. 2 Shaft Planned at Iron King

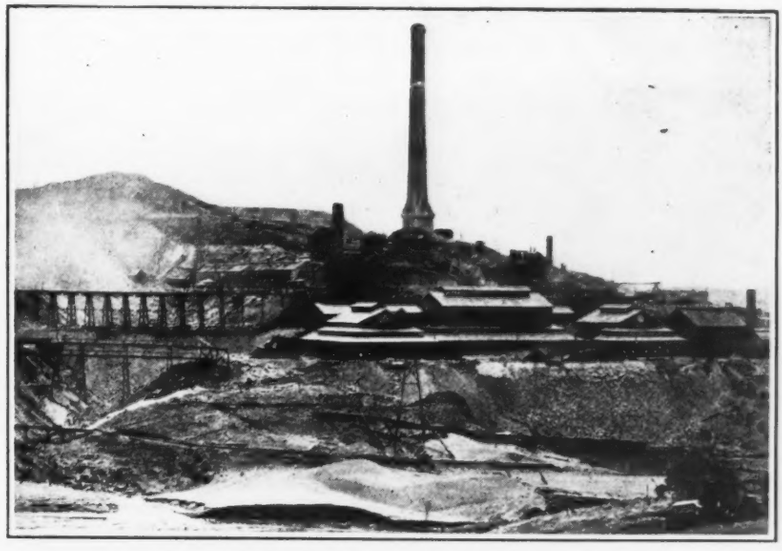
A block of 674,000 shares of stock in the Iron King Consolidated Mining Co. has been purchased by the Tintic Standard Mining Co. By this arrangement the Iron King indebtedness to the Tintic Standard is cancelled and the Iron King provided with funds for development of its property, which adjoins the Tintic Standard's in the East Tintic district of Utah. Exploration of the Iron King will be conducted through the No. 2 shaft, which is to be deepened to the 1,400 level to reach the Ophir formation. James W. Wade, assistant manager of the Tintic Standard Mining Co., will direct development of the Iron King mine for a period of five years.

Oba, Northern Ontario, Scene of Much Gold Prospecting

Erection of Town in Progress in the Kamiskotia District—Bush Fires Threaten Mining Properties

The recent discovery of gold in the vicinity of Oba, northern Ontario, is attracting considerable attention, and the movement of prospectors to the area is fast assuming the proportions of a real gold rush. Interest in the field has been greatly heightened by the entrance of engineers representing important operating companies, including Hollinger. Most of the prospectors now entering the field are from northern points, a considerable representation being from Haileybury, Kirkland Lake, and Cobalt. It is reported that more than 150 claims have already been recorded. The field in which the original discoveries were made lies within the triangle formed by the junction of the Algoma Central and Canadian National Railways at Oba, 270 miles west of Sudbury. Now, however, the activity has spread to the west of the Algoma Central right-of-way and the latest arrivals are going to the region around Lake Kabinigogami. The showings on the early discoveries in the field were found in narrow parallel quartz veins associated with porphyry intrusions in a wide shearing zone which is greatly schisted. Free gold can readily be spotted on one group of claims for quite a distance in these narrow, but rich, veins. It is reported that the latest discoveries west of the Algoma Central are in wider veins equally rich.

Good results are shown from work being carried on at Grace mine, in the Algoma district of northern Ontario, which is under option to the Power & Mines Corporation. Sinking is continuing below the 400-ft. level. While cutting the station at the 400-ft. level the workers encountered a 3-ft. vein, which showed considerable free gold. It is the intention of the company to continue sinking until the 500-ft. level is reached, and then commence the actual opening-up of the property. W. E. Simpson, consulting engineer, recently stated that he was convinced



A nearer view of Mount Morgan's copper smelter

that the district will prove to be a big dividend payer.

Revised statistics on the Canadian output of metals of the platinum group, as reported by the mining, metallurgical, and chemical branch of the Dominion Bureau of Statistics, show that these precious metals were produced in 1926 only in the provinces of British Columbia and Ontario. Canada, however, stands third in the world's production. In British Columbia small quantities are found in placer deposits with alluvial gold and black sands. In Ontario these rare metals occur with the nickel-copper-sulphide ores of the Sudbury district. Platinum produced in the dominion during 1926 totaled 9,521 oz., an increase over 1925 of nearly 1,000 oz. Palladium and rhodium produced last year totaled 10,024 oz., being 2,000 oz. more than that produced in the previous year.

A start has been made on the building of a town in the Kamiskotia mining district of northern Ontario. Permits have already been issued for the building of several stores in a section known as the Hollinger landing. It is reported that Hollinger has bought twenty more claims in the Jamieson township of the district, adjoining its holdings.

Bush fires, which raged for several days recently in the Kirkland Lake district of northern Ontario, threatened some of the important mining properties there. The fire came within 50 ft. of Ossian gold mine shaft, east of Larder Lake. This and other properties were saved by heavy rain which extinguished the fires.

High Up Mill at Virginia City Is Reconstructed

Operations at the High Up property, near Virginia City, Madison County, Montana, have recently been resumed. The cyanide plant has been reconstructed for a capacity of 100 tons. For the present intermittent mill operations are planned during the development of the orebody, which consists of both sulphide and oxidized gold-bearing ore containing very little silver. I. O. Proctor, formerly metallurgist with the Timber Butte Milling Co., is in charge of operations. The mill on the property is shown in the photograph below.

The High Up mill near Virginia City, Madison County, Mont., which has been reconstructed for a capacity of 100 tons

London Letter

By W. A. Doman

Special Correspondent

Russo-Asiatic Consolidated Buys Lead-Zinc-Silver Mines in France

London, June 7—Recognizing that the Soviet government has not for some years been disposed to return the concessions of the Russo-Asiatic Consolidated, Ltd., and that the position has not been improved by the break between the Soviet and the British Government, Leslie Urquhart, chairman of the directors, has wisely decided to take a new attitude. For him to part with the vast mining properties which he has promoted and controlled, and which were likely to bring immense wealth to the Russian people themselves, as well as a fair reward upon the capital of the British interests who had supplied it—and Leslie Urquhart put his own fortune into the business—must have been a great wrench; but it is useless to continue inactive in regard to these Russian properties. The company having a substantial amount of cash, a large part of it was employed in purchasing an interest in the Villemagne lead-zinc-silver mines in the South of France, and a majority interest in the Mines de St. Sebastien d'Aigrefeuille, another lead-zinc-silver property. That Russo-Asiatic may resume its activities, it is proposed to reorganize the capital. The nominal amount is to be reduced from £12,000,000 in £1 shares to £4,500.000 in shares of 2s.6d. each, with a reduction of the present issued capital from 8,462,907 shares of £1 each to the same number of 2s.6d. shares. Shareholders will retain, free of payment, one fully paid 2s.6d. share, and will have the right to subscribe at par for £793,397 in shares of 2s.6d. each in the proportion of three new shares for each four shares held. Outstanding debentures will be redeemed by payment of £60 in cash and £40 in fully paid shares of 2s.6d. each for each £100 of debenture stock.

The last has not been heard of the option on the Mount Isa property, in Queensland. News from Australia states that the difficulty at the property is that the body of rich ore as opened up is represented by carbonates, much of which is low grade, and to treat it commercially involves a different problem from the handling of lead-zinc sulphides. It is suggested, too, from the other side that the labor problem was one which the Anglo-American Corporation did not care to face, and representations have been made to the labor government to modify conditions.

Owing to the decline in the prices of lead and zinc, the profits of the Zinc Corporation for 1926 fell by £120,898 to £424,048, and the ordinary shares received a dividend of 70 per cent or 10 per cent less. Another factor making for reduced profits was a shortage of water, but despite this drawback the tonnage of ore raised was virtually the same as in 1925 at 245,119 tons, and ore reserves are only 26,700 tons down, at 2,467,061 tons, the assay value being unaltered. Considerable improvement was made in the metallurgical branch, lead concentrates resulting in recoveries of 91.9 per cent lead and 84.9 per cent silver, or 1.1 per cent and 4.1 per cent higher than in 1925. A similar gain was made in regard to zinc, the recovery in the concentrates being 79.1 per cent, compared with 71.4 per cent. Working costs were lowered 10d. per ton.

Although no official announcement has been made, it is suggested from Moscow that the Lena Goldfields concession is to be internationalized. The matter has been discussed already in Germany and is soon to be considered in Paris.

Five Geological Parties to Work in British Columbia

The Geological Survey of Canada has announced that its summer program in British Columbia includes a survey of the Finlay River district, in the Peace River region, in charge of Dr. Dolmage, head of the British Columbia branch office. Dr. Hanson will continue the survey of the Portland Canal district, giving particular attention to the Marmot River section; also, he will make an examination of the recently discovered ore deposits in the vicinity of Topley, on the Canadian National Railway, which are attracting much attention just now. Dr. Cairnes will continue the survey of the west Kootenay district, Dr. Marshall will survey the Clearwater district, in the Kamloops mining division, and Dr. Cockfield will make a study of the northern extension of the coast batholith, near the British Columbia-Yukon boundary.

Silversmith Mines has completed the remodeling of its mill to a flotation concentrator of 250 tons daily capacity, and has put it into operation. The mill, which originally was a gravity-flotation concentrator of 125 tons capacity, is being fed by ore drawn from the 800-, 900-, 1,000-, and 1,100-ft. levels on the Slocan Star and Silversmith ore-shoots and from ore developed in the adjoining Slocan King mine, which is being operated under the same management. The Silversmith mill has been idle since November of last year. The company has been pushing development work, which had been allowed

to fall behind in an effort to make high production.

Duthie Mines has completed the 50-ton flotation mill at its Henderson mine, on Hudson Bay Mountain, 13 miles from Smithers, and put it into operation.

The Premier Gold Mining Co. has declared a dividend of $400,000, which represents a rate of 32 per cent per year. The dividend covers operations during the second quarter of this year and is payable on July 14.

Richmond-Yukon Copper, Ltd., which acquired the Yukon-Pueb'o and Tamarac-Carlisle mines, situated on a spur of the White Pass Railway about 13 miles from Whitehorse, last summer, has since steadily been exploring and developing the two properties. The company has announced that diamond drilling at the Pueblo-Yukon indicates an entirely new ore-shoot, 13 to 23 ft. wide 400 ft. long, carrying about 3¼ per cent of copper. Pending the arrival of a compressor, engine, and other equipment necessary for the development of this shoot the company turned its attention to the old Carlisle mine. The 130-ft. shaft was cleaned out and retimbered and the three levels at 50, 90, and 130 ft. were extended into high-grade copper ore. The bottom level was driven for 130 ft. in ore, with the face still in ore. A crosscut from wall to wall in the bottom drift gave the vein a width of 25 ft. Approximately 1 000 tons of ore won in this development was shipped to the smelter and brought a return of 4.2 oz. of silver per ton and 23.5 per cent of copper. Prior to acquirement by the present owners the Yukon-Pueblo is said to have shipped 140,000 tons of ore, averaging 6 oz. in silver per ton and 3.5 per cent of copper. It was developed to a depth of 500 ft.; the main stope caved in in 1917, and since then the mine has been closed.

Ore Reserves of Utah Apex Greater Than Last Year

During the first six months of its fiscal year the Utah Apex Mining Co. produced approximately 14,148,000 lb. of lead, 6,000,000 lb. of zinc, 3,358,000 lb. of copper and 324,200 oz. of silver. These figures compare with output in the last full fiscal year of 35,310,657 lb. of lead, 15,377,216 lb. of zinc, 5,706,095 lb. of copper and 822,737 oz. of silver.

The company has continued its aggressive exploration campaign, and its ore reserves are estimated to be approximately 105,200 tons of lead-zinc, 50,700 tons of lead-copper, and 21,500 tons of copper shipping ore. A year ago lead-zinc reserves were 67,000 tons and lead-copper reserves 61,800 tons, and the company had no copper ore blocked out. Views of a portion of the company's surface plant are shown in the accompanying photograph.

Mack Copper Co. Receives Award

The Court of Claims has awarded the Mack Copper Co. $229,500 for use by the government of 5,039 acres of its land near San Diego, Calif. The land was used during the war as an army camp site.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Noranda Main Shaft Down 500 Ft. —Nipissing Cuts Dividend to 1½ Per Cent

Toronto, June 18—Noranda shareholders are in receipt of official announcement to the effect that although the construction of the Horne smelter, the equipment of the Horne mine, and the development of the Noranda townsite are progressing satisfactorily, it is now apparent that the cost of this program will considerably exceed the estimates made. To a considerable extent this extra cost is due to pushing the work during the period prior to the advent of the railway in order to reach the production stage at as early a date as possible. It is also announced that an arrangement has been made with N. A. Timmins and N. A. Timmins, Inc., under which Noranda will execute options held by it on the Waite-Montgomery and Alderson-MacKay properties and will form companies to take over the ownership and operation. Shares representing approximately 81 per cent of the Waite-Montgomery and 70 per cent of the Alderson-MacKay will be delivered to Noranda and Mr. Timmins, whose company is accepting Noranda shares in full payment.

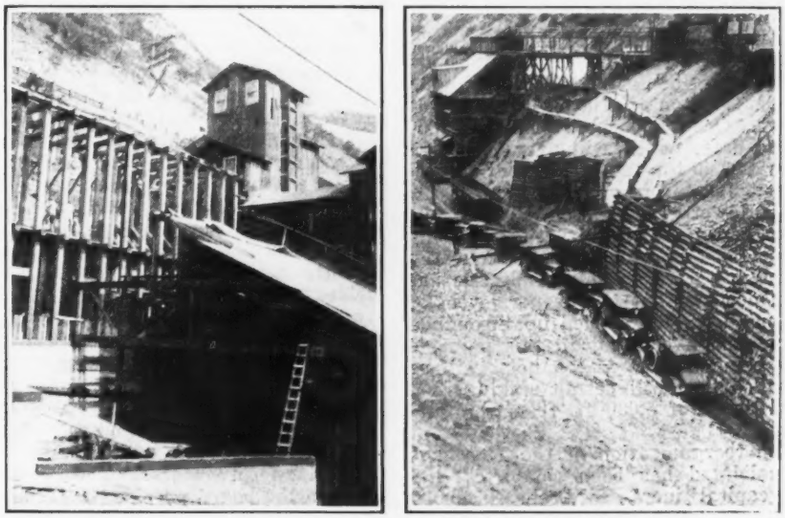
In order to provide for such purchases, to provide funds for the development of these properties and to provide for the additional cost of the construction above the previous estimates, it is necessary to raise more money, which will be done by increasing the capital stock of the company. A special meeting has been called for June 24, at which shareholders will be asked to ratify a bylaw passed by the directors authorizing an increase in the capital stock of 250,000 new shares of no par value, which will be offered to the shareholders for subscription on terms and basis to be announced later.

The Noranda main shaft is now down 500 ft. and within a month should be at the 600-ft. level when the 400-, 500- and 600-ft. levels will be opened up simultaneously. A machine drill is at work opening up the surface discovery made last fall within 100 ft. of the crusher station. Although values running up to 15 per cent copper across 25 ft. have been encountered, it is too early as yet to estimate any average.

On the Amulet property one of the recently discovered orebodies found on the surface has been crosscut on the 150-ft. level in the No. 4 shaft, where the ore is understood to be high grade, but officials will not make any statement until they have further information. Some of this ore is within 100 ft. of the Area boundary, and the latter company is endeavoring to locate it on the Turcotte claim. It is understood that the final option payment has been made on the Turcotte property by the Area company.

The annual report of the Keeley Silver Mines for the year ended Feb. 28 last shows a production of 1,640,000 oz. of silver and 185,830 lb. of cobalt, having a gross value of $990,963. This is an increase of 130,000 oz. as compared with the previous year, but a decline in value of $108,000. Operating expenses were $430,639 and the profits amounted to $538,698, a decrease of $106,000. During the year dividends amounting to $480,000 were paid. The tonnage treated was 24,705 tons, averaging 24.3 oz., the average recovery being 21.2 oz. and the cost per ounce 29.2c. Ore reserves now stand at 1,091,000 oz., a decrease of 410,000 oz. The average price received for silver was 58.17c. per ounce, as compared with 68.94c. in the preceding year. The net current assets, consisting of cash, bonds, and silver on hand and in transit, amounts to $1,054,029. The most important developments during the year were those obtained in the western part of the property, on the No. 28 vein on the 11 level, which is 820 ft. below the collar of the No. 3 shaft. In this locality three shoots of ore having an aggregate length of 166 ft. and an average assay of 1,800 oz. over 6 in. were developed. One of these shoots has been followed downward through the winze and developments are now proceeding on the 895-ft. level.

The directors of the Nipissing Mining Co., who met in New York a few days ago, decided to cut the dividend



The Utah Apex Mining Co., Bingham, Utah. Left—Extension of mill under construction. Right—Surface plant at Carr Fork canyon

rate and have declared a payment of 1½ per cent payable July 20. This is half the former regular quarterly dividend of 3 per cent. No announcement of the results on the Montbray properties was made. The new discoveries recently made on the 70-ft. level of the Lorrain Trout Lake property continue to increase in importance as developments progress. Six different showings of ore were found at this level, but indications pointed to their apexing a short distance above the level. It was decided to sink a winze, which is now down 16 ft. High-grade ore continued down the winze and the last round has opened up what appears to be an entirely new vein varying in width from 7 to 12 in. and assaying approximately 3,000 oz. to the ton. The workings appear to be in the center of a regular nest of veins, and developments during the next few months may be exceedingly important. This property is operated by the Mining Corporation, which holds a half interest. The company's own operations in South Lorrain are also extensive, and the recently discovered ore on the Crompton claim 1,400 ft. from the surface also appears to be very important; 25 ft. of ore has been opened up which shows 500 to 1,300 oz. a ton across widths of 6 to 12 in. A station is being cut at 1,425 ft., where a level will be opened up. It is not as yet known whether this is the famous Woods vein or an offshoot. Operations at the company's Cobalt properties are going along well and the new shaft at Cross Lake is down 175 ft. Some time this fall underground developments will be proceeding in the underlying conglomerate.

The transmission line from the Great Northern plant, on the Montreal River, to Kirkland Lake has been completed and power is now being furnished. This will make an additional 3,000 hp. available for the Kirkland Lake mines and should take care of increased consumption for some time to come. This fall the transmission line from the Quinze development to Kirkland will be completed. The Quinze power is 25 cycle, whereas Kirkland uses 60 cycle, so that frequency changers will be necessary. To install this and other equipment to meet the demands of the Kirkland mines the substation is being doubled in size.

Developments on the 2,475-ft. level of the Kirkland Lake Gold Mines are showing up ore of considerably higher grade than on the levels immediately above. Ore has been developed for 200 ft. to date, which will average better than $20 a ton, across a width of at least 5 ft., and in addition there is 100 ft. of lower-grade material across the same width. The mill is now treating about 140 tons a day and the company is making a reasonable profit. It has been decided that the deeper levels of the mine will be opened up through a winze and a crosscut to this point is now being completed. A hoist will be installed that will permit sinking to a total depth of 5,000 ft. from the surface.

The reorganization of the Argonaut Consolidated has been completed and the capital increased from 3,500,000 shares to 5,000,000 shares of $1 par. It is understood that 1,000,000 shares have been underwritten at 30c. a share.

Melbourne Letter

By Peter G. Tait
Special Correspondent

Copper Producers Seek Bounty—Mount Lyell Co. Submits Cost Statistics

Melbourne, May 19—A large party of directors and officials of the Broken Hill and associated companies paid a visit to the field and to the Associated Smelters at Port Pirie recently. On their return to Melbourne, W. L. Baillieu, chairman of the directors of the North Broken Hill Co. and the Broken Hill Associated Smelters, said it was satisfactory to note the steady improvement in the treatment processes at the different mines. Though there was friendly competition between the staffs, there was also a hearty co-operation which reacted to the advantage of shareholders. In regard to ore reserves, he said that recent work at the 1,700 level of the North mine showed that the lode persisted in size and value at depth. The works of the Broken Hill Associated Smelters at Port Pirie had attained a degree of efficiency that could not be excelled anywhere in the world. Additional improvements are proposed as opportunity offers. It was thought at one time that the ore could not be smelted economically in Australia, but it had been demonstrated that it was more profitable to treat the ore in Australia than to ship it overseas. Prior to the war over 80 per cent of the concentrates was shipped overseas, but practically the entire production is now smelted locally.

The National Mining Corporation, Ltd., of London, whch holds large interests in mining ventures in all parts of the world, has acquired a holding in the old Lake George group of mines in New South Wales. When previously worked for copper the enterprise was a failure. Nothing has been done at the property since 1899. Attention is now being directed to the zinc-lead lode. Prospecting operations are in progress to determine the tonnage available and the best method of treatment. The outcrop lode has been traced for a distance of about 4,000 ft. and the underground work seems to show that it varies in width from a few feet to 40 ft.

A new find of gold, three miles west of Westonia Township, and said to be the richest find since the Edna May days, is reported from Southern Cross, Western Australia. Specimens were obtained at a depth of 115 ft. from the surface, where the lode is from 6 ft. to 12 ft. wide. A shipment of 114 tons recently treated at the local battery yielded 132 oz. 2 dwt. of gold. A Perth syndicate headed by C. de Bernales and M. J. McDermott has secured a twelve months' option over the property.

Further evidence in support of the request by Australian copper producers for a bounty was submitted recently to the commonwealth tariff board by Queensland producers. The request made to the board provided for a minimum bounty of £10 a ton on all copper produced and refined in Australia while the price of standard copper remained under £66 a ton, the bounty to decrease by 20s. a ton for each increase on the price of copper by 20s. over £66, until the bounty disappeared at £76 a ton; and also for an export duty of £4 per ton on copper not refined in Australia, such copper not to participate in the bounty. Representatives of the Mount Morgan and Mount Elliott companies urged the national importance of the industry, and both stated that the proposed bounty would encourage the directors of the respective companies to go ahead with proposals involving the outlay of considerable capital.

Notwithstanding the serious plight of the industry, it is significant that Mount Lyell is threatened with higher costs. The case is now before the arbitration court. In an affidavit R. M. Murray, general manager of the company, said that Queenstown, Gormanston, and Strahan were entirely dependent upon the company, which employed 1,000 men, and whose annual payroll exceeded £260,000. The industry was therefore vital to the local population, and its preservation was of prime importance. In his judgment of October, 1924, Mr. Webb, deputy president, said: "The evidence with regard to Mount Lyell is that it is just paying its way and is making no profit. I think it would be a tragedy if this mine were compelled to follow the example of the Waterloo mine." The position is now even more serious, as the price of copper is £5 7s. 6d. less than it was then. The company's annual copper output is about 7,000 tons and the cost of production is more than the present market price. Between 1912 and 1926 the basic wage had increased from 9s. to 13s.; the price of coal from 27s. 3d. to 50s. per ton; coke from 30s. 3d. to 63s. 5d.; blasting gelatine from 54s. to 64s. 3d.; gelignite from 41s. 6d. to 53s. 6d.; freight on copper from 12s. 6d. to 20s.; and the Port Kembla refining cost from £3 10s. to £9 1s. These adverse conditions had resulted in all other companies going out of business; the Mount Lyell company had survived only by spending £175,000 in six years on plant and machinery. The company's stated capitalization is £735,000. Operations in the last six years have yielded a return of less than 3½ per cent per annum. The company is spending £135,000 on a copper refinery and on a tunnel to connect the mine with the works. An addition of 1s. to the basic wage would cost £15,000 a year, or more than £2 per ton of copper produced. The court has not as yet announced its decision.

Two Recent Duluth Court Decisions of Interest

Two recent district court decisions in Duluth involve matters of interest to mining investors and operators.

In one of these cases a group had arranged to trade in blocks of stock in an operating lead mine in Mexico, and were to share in the profits to rise from their advance information. Three of the group were alleged by the others to have formed an inside pool to the financial injury of the remaining others, who sued for an accounting and division of all profits arising from a consequent advance in the price of the

stock. The jury returned a verdict against the three and the judge assessed damages against the defendants.

In the other case a group arranged to take over a mining lease on a Mesabi property at a royalty rate of 60c. a ton. This rate represented a profit of 20c. a ton to the original lessee, who had secured the property from its fee owners at a 40c. royalty rate. One of the group, however, had a secret arrangement with the original lessee that he and the original lessee were to divide the 20c. The group member in this secret arrangement then interested friends and formed the Stanley Mining Co. to operate under the 60c. lease, and in which company he became a director. It was seen by the other group members that he was acting as a seller as well as a buyer, and his associates sued for their alleged share in the intermediate 20c. a ton. Approximately 250,000 tons were shipped from the mine. The court, in its memorandum, stated that "a fiduciary relationship existed between the parties; a secret profit was made by one of them; in the court's opinion he was not entitled to this, legally or morally, and should account for it."

Montana Idaho Mines Buys Four Patented Claims

The Montana Idaho Mines Corporation has purchased four patented mining claims adjoining its East Pacific group, about six miles from Winston, southeast of Helena, Mont. Ore was shipped from the new claims by former owners. The claims will be developed as quickly as the company's new power plant is completed, and within a short time the company's mill will be remodeled and in operation.

Of the Western zinc-producing states Montana now ranks third, being surpassed only by Oklahoma and Missouri. The output last year was 137,000,000 lb., valued at $10,070,000, an increase of 21,680,000 lb. over 1925. With additional reduction capacity now being installed by the Anaconda Copper Mining Co., the production in 1928 should be materially increased.

The state division of publicity reports that the mines of Montana in 1926 produced 12,570,000 oz. of silver, valued at $7,844,000. At the close of the year the state stood second as a producer of silver, Utah being the leading producer. Montana has produced about $375,000,000 worth of silver.

Moore Mine Discontinues Sinking Shaft at 2,291 Ft.

The Moore Mining Co., of Jackson, Calif., has discontinued shaft sinking, the present shaft bottom being 491 ft. below the 1,800 station. Exploration is being continued upon the 640, 800, 950 and 1,800 levels, but no new orebodies have been encountered. It is believed that the 1,800 west crosscut is nearing the assumed position of the extension of the Kennedy-Argonaut vein, and a crosscut is being driven westerly toward the South Jackson vein from the 1,800 northwest drift. An additional assessment of 1c. per share has been levied.

Johannesburg Letter

By John Watson

Special Correspondent

Strike at City Deep Gold Mine Ends Pending Discussion of Alleged Grievances

Johannesburg, May 17—The Transvaal output of gold for the month of April was declared on May 10 by the Chamber of Mines as 824,014 oz., equal in value to £3,500,189. Compared with the previous month, these figures show a decrease of 36,497 oz., equal to £155,029. April, however, had two working days less than March. The native labor returns show an increase of 1,006 "boys" working at the gold mines of the Witwatersrand at the end of April, compared with March 31.

Lydenburg Platinum Areas, Ltd., report for the quarter ended March 31 shows a total development of 596 ft. The ore treated totaled 4,713 tons and the estimated recovery of platinoids was 1,006 oz., or 4.522 dwt. per ton. During the quarter 1,125 oz. of metallics were despatched, of which 1,116 oz. had been sold, the net realized price being £19 18s. 1d. per ounce. The plant at Maandagshoek has been doubled and has been running smoothly since March 18.

Onverwacht Platinum, Ltd., reports that during April 2,322 tons were milled, giving an estimated yield of 745 oz. of refined platinum-group metals, equal to 6.4 dwt. per ton milled. The prospecting shaft disclosed values averaging 3.87 dwt. from 406 to 418 ft. depth, 1.12 dwt. from 418 to 427 ft., and 5.23 dwt. from 427 ft. to 439 ft. The April yield of refined platinum-group metals is an increase of 63 oz. over the March figure.

At the City Deep gold mine on May 9 normal conditions were restored by the miners who have recently been on strike; they returned to work pending the discussion of their alleged grievances at a "round-table conference." Such a conference was initiated between representatives of the Gold Producers Committee and the Mine Workers Union at the New Law Courts by the Minister of Labor.

Central Mining Corporation shows a profit for 1926 of £668,586. The company recommends a final dividend of 8s. and a bonus of 4s., making a total tax-free dividend for the year of 20s. The Transvaal provincial council last week passed the shop-hours ordinance which will compel Johannesburg shops to close on Saturday afternoons. A town meeting held in the Johannesburg town hall on May 10 was almost unanimously in favor of Saturday afternoon shopping, as in the past.

Solomon Dinizulu, chief of the Zulu nation, has been awarded £600 and costs against the *Natal Mercury* for defamation, arising out of an article published at the time of the visit of the Prince of Wales to Eshowe, Zululand.

The American Trade Commissioner, Perry J. Stevenson, is relinquishing his appointment, after three years' service here. He has won for himself the esteem and warm regard of all with whom he has come in contact. He will be succeeded by S. H. Day. F. E. Sullivan is remaining in Johannesburg as assistant trade commissioner till October, when he returns to the United States, to take up another appointment.

Statistics recently issued by the mines department show that gold to the value of £810 was recovered during March in the Pietersburg district. The number of base-metal claims held on March 31 was 47,900, compared with 49,078 on Dec. 31 last. These claims have been pegged principally for asbestos, corundum, mica, tin, and platinum.

The Potgietersrust Platinum, Ltd., report for the past quarter which appeared recently showed that underground work has been curtailed considerably in the Potgietersrust district. The ore crushed and treated by the flotation process amounted to 6,000 tons, which produced 85 tons of concentrate containing 252 dwt. platinoids per ton, and of which 38 to 40 per cent was platinum and the balance palladium. In base metals, the concentrates contain 8 per cent nickel and 3.2 per cent copper. A further 100 tons of concentrate have been consigned to England.

The South African Association for the Advancement of Science will hold its twenty-fifth annual meeting at Salisbury, Southern Rhodesia, from June 29 to July 4. The president, Prof. H. B. Fantham, will deliver an address on "Some Thoughts on Biology and the Race." An evening lecture will be given by Dr. A. L. du Toit on "The Kalahari and Some of Its Problems." The South African medal and grant will be presented to Dr. Annie Porter, of the South African Institute of Medical Research, Johannesburg. Sir J. Carruthers Beattie will serve as president during the forthcoming year.

The share market in Johannesburg has been quieter during the past week. West Springs have been in demand and rose from 30s. 9d. to 33s. 3d. Sub Nigels were also largely dealt in, and their price has risen from 79s. 3d. to 82s. Modder Easts have fallen from 35s. 3d. to 32s. 7½d. Potgietersrust Platinum has fallen from 7s. 9d. to 7s. 4d. during the week.

Austrian Iron Ore Shipments to Rhenish Prussia

A contract has just been entered upon between the Austrian Alpine Mining Co. and the United Steel Works of Düsseldorf according to which the first-named company will ship iron ore from the famous Erzberg—ore mountain—to the steel works in Rhenish Prussia, where it will be worked into steel. In 1923 the Alpine Mining Co. acquired the majority of the shares of the Bismarckhütte to satisfy its demands for coke. In order to avoid a costly deadweight run of the cars which bring the coke from the Rhineland to Styria, the ore-supply arrangement was entered upon. The German railway administration has already conceded special rates for the ore transports, and it is expected that the Austrian federal railways will also grant a special tariff.

Societies, Addresses, and Reports

Italy's Economic Situation

Rise in Lira Impedes Development—Wage Reductions May Test Strength of Mussolini Régime

By Edward J. Mehren
Vice-President, McGraw-Hill Publishing Co., Inc.

Milan, May 30, 1927

SO MUCH has been written lately about Italy and Italian conditions that one is in danger of repeating what is already well known in the United States. But in this article the emphasis will be laid on the economic and industrial situations; the political and social naturally get most attention. Even in an economic discussion the political and social conditions cannot be excluded. The social situation, in particular, forces itself on the attention of the visitor. It is the outward spirit of the new Italy; it permeates the atmosphere and colors every contact that one has on the streets, in offices, in railway trains.

THE NEW ITALY

Before proceeding to the economic situation let one instance of this spirit be given. Coming by motor over the Simplon Pass we picked up two punctures near the border. Changing one tire, we limped into Domo d'Ossola by pumping the other at intermediate points. Our first need, therefore, was a garage, so we stopped at a corner café (the respectable European brother of the former American saloon) to make inquiry. After getting directions and arranging to send the car to the garage I reached for my overcoat lying on top of the luggage. Immediately our informant remarked that in Italy I need not worry; the coat would be safe; and this man had an understanding of my mind, for he had spent six years in America. What he said was brief, but it was said with pride and confidence.

This note, struck at our very entrance to Italy, has recurred again and again. Italy socially is a new land. Its people are conscious of the change and show their pride. Underneath there may be—there undoubtedly is—grave reservation as to the need or wisdom of the methods that have been employed; but, for the obtaining of results, "the plan works," and to the hurried traveler all looks placid.

ECONOMIC SITUATION

As to economic conditions, it is clearly evident that prosperity reigns; having seen Western Europe, including Germany, in the low ebb of 1920, the difference is apparent. The people on the whole are well dressed and have a confident bearing. The latter point is important; judged by the economic experience of other countries, Italy should now be under severe economic distress. A year and a half ago the lira stood at 30 to the dollar. Now it is 18½. It has gone from, say 3½c. to 5½. The usual accompaniment of such a rise is the falling off in buying power and a decline in exports, resulting in a decrease in demand on industry, unemployment, and the usual accompanying distress.

These phenomena are not absent here now, but, as yet, there is not a crisis. There has been export decline, but it is slight. There is unemployment, but not serious, though a goodly number of factories are on a part-time basis.

This improvement in the value of the lira was a cause for congratulation on the part of Mussolini in opening the Parliament last Thursday (May 26). It was said two years ago that Fascism had lost the economic battle—the "battle of the lira"—even though it might have triumphed in other fields. For that reason the Prime Minister had directed the Minister of Finance, Volpi, to take all needed steps to improve the financial position. The objective has been attained, said the Duce on Thursday; Fascism had demonstrated that in this field, too, it was equal to the situation.

WAGE AND PRICE REDUCTIONS

The crux of any situation like this is that prices are not reduced in proportion to the increase in value of the exchange medium. The Fascist régime is now tackling this point. As of June 1 the salaries and wages of all in national government service will be reduced 10 per cent; this includes the wages of post office and railway employees. Through the Union of Confederations of Industry, the industries will be requested to make a similar reduction. But wage reductions alone would virtually increase the cost of living, by reducing the purchasing power of the worker. Therefore, there has been decreed compulsory decreases in rent and in food necessities. Rent, now from five to seven times pre-war prices, must be reduced to four times the pre-war basis. Milk, bread, rice, macaroni (and its various brothers), and meat have been reduced 10 per cent. The enforcement is very severe, and precautions are taken that the law be not evaded by decreasing quality. Last week, in Milan, eighteen shops were closed for not complying with the law.

Going still farther, the communes are co-operating and have requested all merchants to make general reductions in prices. The shop windows in the cities and towns are almost all displaying reduction signs; and the reductions range, so the signs say, up to 30 per cent.

The hotels have put into effect a 10 per cent reduction and hope, they say, to make further reductions. Here necessity has been an added spur; the tourist travel had fallen off.

Obviously, the 10 per cent decrease is out of all proportion to the increase in the value of the lira; even the sharp recent increase has been 40 per cent. A beginning, however, has been made, and those who believe that a sharp crisis will be avoided look forward to a repetition of the recent price and wage reductions.

Incidentally, these wage reductions may well be a test of the strength of the Mussolini régime. It is easier to hold the multitude on a rising market than to lead them backward. True, price reductions may hold the purchasing power even, but cash in hand means more to the unlettered than purchasing power. Nevertheless, the fulsome advertising in the press, by commune proclamations, by displays in shop windows, and by general conversation, constitutes a mass campaign of education that may impress everyone.

One card is up the Premier's sleeve. With the control he has he could let the lira slip back again, and start a buying boom. So, all in all, the situation would seem to be in hand, even though the stage is set for economic stress just now.

Tentative Program of Salt Lake City Meetings

The principal session of the annual convention of the Western Division of the American Mining Congress to be held in Salt Lake City has been tentatively assigned to occur Aug. 22. The regional meeting of the Utah section of the American Institute of Mining and Metallurgical Engineers has been assigned for Aug. 23 and 24.

J. O. Elton will preside over the morning session on Aug. 23, when the subject to be considered will be the importance of flotation to the mining industry. Papers will be read on the effect of flotation on mining, smelting, milling, geology, and the general welfare of Utah.

G. H. Clevenger will preside over the afternoon session on Aug. 23, when technical papers will be read on flotation in the Salt Lake Valley and various mining districts of the United States.

D. A. Lyon, chief metallurgist of the U. S. Bureau of Mines, will preside over the morning session on Aug. 24, when technical papers on flotation will be given.

At the afternoon session on Aug. 24 a round-table discussion of refractories will be held with E. P. Mathewson, former president of the Institute, as chairman, and G. L. Oldright as secretary. D. A. Lyon will be chairman of a round-table discussion of mill balls and crushing, and J. W. Wade and J. M. Boutwell will be chairmen at a session at which papers will be read on geology and mining in the Utah region. At one of the evening sessions the film of the Bureau of Mines on copper will be shown.

The Bureau of Mines and the department of metallurgical research of the University of Utah will provide an exhibit showing the application of research in the solution of ore treatment problems. Mr. Lyon will leave Washington on June 20 for Salt Lake, to remain until after the convention. On Aug. 25 the delegates will be taken on a scenic trip around Salt Lake and vicinity.

The Progress of Electrolytic Zinc

Oliver C. Ralston, U. S. Bureau of Mines, Presents Interesting Paper at Annual American Electrochemical Society Meeting

AMONG the many papers presented at the fifty-first general meeting of the American Electrochemical Society held in Philadelphia, Pa., on April 28, 29, and 30, that entitled "Twenty-five Years' Progress of Electrolytic Zinc," by Oliver C. Ralston. Superintendent, U. S. Bureau of Mines, Pacific Experiment Station, Berkeley, Calif., is of particular interest to the mining industry. Excerpts from the paper follow:

Statistics of United States total zinc production, and the percentage which was made electrolytically for the last three years, together with forecast for 1927, are as follows:

Year	Total Zinc, Tons	Electro Zinc, Tons	Per Cent of Total
1924	535,846	77,498	14.4
1925	590,928	80,898	13.7
1926	(*a*) 625,000	111,000	17.8
1927	(*b*) 625,000	(*b*) 120,000	19.2

(*a*) Approximately. (*b*) Estimated.

The first permanent electrolytic zinc plants were those using chloride electrolytes, in the processes devised by Carl Hoepfner. At Fürfurt-an-der-Lahn, Germany, in 1894 and 1895, an experimental plant with sixty cells produced electrolytic zinc and chloride of lime from a chloride electrolyte, resulting from chloridizing roasting of a pyrite cinder containing zinc and copper. This encouraged the building of three plants, two in Germany (one of which was later moved to Austria) and one at the works of Brunner, Mond & Co., Winnington, Chestershire, England. Only the one in England endured for many years. It was shut down a few years ago. None of these plants ever produced an important tonnage of zinc, and none has been adequately described in technical literature.

Coincidentally with Hoepfner's work, E. A. Ashcroft, an English inventor, was developing another chloride process in an experimental plant at Cockle Creek, New South Wales, Australia, and later in England and Norway. His processes went through many metamorphoses, all described in current literature, and occasional patents on improvements are still observed.

Beginning in 1907, John Malm, at Corbin, Mont., brought to light a dry chlorination process for sulphide ores, followed by electrolysis of fused zinc chloride. Test plants were built at Corbin, Mont.; Georgetown, Colo.; Kellogg, Idaho; Niagara Falls, N. Y., and more recently at Denver, Colo. Misfortune has dogged the steps of this enterprise, but adequate literature describes all its steps and is worth reading.

The electrolysis of zinc sulphate solutions really started with Leon Letrange, in 1881, whose German patent of that year described a plant containing essentially most of the ideas now used in the huge successful plants. About 1890-92, B. Roesing applied zinc sulphate electrolyte to electrolytic recovery of zinc from the crusts of the Parkes lead desilverizing process. This resulted in a plant built and operated for two years by the Hamburg Gold und Silber Scheideanstalt.

After 1900 the Siemens and Halske organization took up a sulphate electrolysis, and interested the Smelting Company of Australia to build a test plant at Illawarra, New South Wales, but without commercial result and without any report in the literature beyond a long series of German, English, and American patents.

The General Electric Co. purchased a so-called copper mine at Bully Hill, in Shasta County, California, which later turned out to have more zinc than copper in the ore. This led to research on their part from 1910 to 1915, largely under the direction of C. A. Hansen, on the treatment of the complex mixture of zinc, copper, and iron sulphides, and, of course, electric methods of separation were stressed. At that time the impression prevailed that the sulphuric acid formed at the anode must be neutralized to prevent re-solution of the deposited zinc from the cathode.

Simultaneously and independently this misleading assumption was dissipated by three different individuals or organizations, U. C. Tainton in England, F. Laist and others at Anaconda, Montana, and F. W. Guernsey and others at Trail, B. C. Each of them was able to deposit zinc electrolytically in the presence of considerable amounts of sulphuric acid at the anode, and thereafter electrolytic zinc practice returned to the steps outlined by Letrange. Purification of the electrolyte before electrolysis was the key to the situation. Letrange had said thirty-five years previously that the electrolyte must be purified by known processes, such as those used in making lithopone.

The success of the Anaconda Copper Mining Co. and of the Consolidated Mining & Smelting Co. inspired numerous other organizations to try out the method for their ores and conditions, and many of these trials were ultimately dropped. Among those that have continued is the Electrolytic Zinc Co. of Australasia Proprietary, Ltd., with a plant at Risdon, near Hobart, Tasmania, whose operations have been conspicuously successful, and have been expanded several times since building the first plant. The Hobart, Anaconda, and Trail plants are huge enterprises and dwarf all others in comparison.

When electrolytic zinc methods began to be talked of seriously in 1914 and 1915, men prominent in the zinc industry shook their heads and pointed to the long string of failures in the past, and said that even if technical success were possible economic success would be possible only under unusual conditions. They were probably correct at the time, but unusual conditions were found and taken advantage of, and electrolytic zinc became the almost sole producer of high-grade "spelter" and frequently cadmium or lead had to be added to some of their output, so that it could be sold in the Prime Western market without destroying the differential in price which had been usual in favor of High-Grade. Electrolytic zinc output is still expanding, and more than supplies the market for High-Grade and some of the intermediate grades, and when the less pure grades are now sold at a price concession, it is so recognized; the High-Grade is no longer thought of as bringing a "premium."

In addition, the claim is now made that even in the zinc smelting fields electrolytic methods can now compete on ore containing less than a certain zinc content, variously placed at 45 to 56 per cent.

Three interesting new plants are under way or projected. The Rhodesian Broken Hill Development Co., Ltd., of Broken Hill, Northern Rhodesia, is constructing a plant for treatment of oxidized and sulphide ores that contain an important content of vanadium. The vanadium will be recovered from the zinc sulphate solutions before they are electrolyzed. The Metals Exploration Co. is building a pilot plant at Flin Flon, near The Pas, Manitoba, to treat complex ore containing zinc, copper, iron, silver, and gold. Sullivan Mining Co. has started construction of a 50-ton Tainton electrolytic zinc plant at Kellogg, Idaho, to treat ore from the Star mine, but the plant will probably not be in operation for another year.

The above mention of vanadium recovery reminds one that the cadmium content of the zinc ores is now recovered in the larger plants, and as much cadmium as can be sold is prepared for the market, so that the price has dropped to only a small fraction of the price prevailing in earlier days. Manganese is another element which could be recovered and will be ultimately. Manganese in the solution deposits on the anode as the dioxide, always containing more or less lead peroxide, and at present is discarded.

Third International Congress on Scientific Management

American engineers and industrialists are cordially invited to attend the third International Management Conference to be held in Rome, Italy, on September 5, 6, 7 and 8, under the auspices of officials of the Italian Government.

The program of the convention is to deal with the scientific organization of industrial production, agriculture and commerce, the public service and public utilities, and domestic economy. The papers will be available in English, Italian, French, German, and Spanish and may be discussed in any of these five languages.

A large part of the program will be furnished by Americans, and it is hoped that there will be a large and active participation in the congress by American engineers. Those who may find it possible to attend can obtain further information from Dr. H. S. Person, secretary of the Committee on American Participation in International Management Congresses, Room 611, 29 West 39th St., New York, N. Y.

Recent Technical Publications

Reviews, Abstracts, and References

Business Cycles and Business Measurements. By Carl Snyder. The Macmillan Company, New York City. Pp. 326. Price, $6.

The striking variations in the fluctuations of trade, from prosperity to crises and depression, which we have come to call "business cycles," have had in the United States a greater intensity, and, therefore, arouse deeper interest, than in perhaps any other country; and many attempts have been made to determine definitely the extent and regularity of this movement. It is only in recent years, however, and largely following the great burst of interest aroused during the war, that material has been available from which to make such definite measures. In this book the author has sought to put together this wealth of new material, and from it to derive measures of business from month to month, one important factor of which is a wide composite of a weighted average of fifty-six independently computed series. Others have been found in close agreement with this broad combination, and building upon these foundations and the relationships therein established, it has been possible to carry back several measures of trade through more than half a century. These measures seem to show that the crises associated with the business cycle reached their intensity in the latter part of the nineteenth century, and have since been of distinctly lessened severity; but the course of these fluctuations is of wide import, and it is of deep interest to the business man, especially, to know just what is the current position of industries and trade with reference to that persistent and never-ending growth which, as the author has been at pains to show, is one of the fundamentals of American business.

The new measures of trade and productive activity which form the bases of the author's deductions are set forth graphically in a series of over forty full-page charts, and with these are given tables of index numbers from which the graphs are derived—a feature which will be of interest to students of business conditions.

R. M. DAVIS.

Geology of Alaska—The U. S. Geological Survey has issued Bulletin 791, pp. 92, written by J. B. Mertie, Jr., on the subject "Geology of the Upper Matanuska Valley, Alaska." The bulletin may be obtained for 30c. from the Superintendent of Documents, Washington, D. C.

Flotation and Radio Prospecting—The June 10 issue of the *Canadian Mining Journal* (Gardenvale, Quebec; price 15c.) contains an article by C. S. Parsons on "Selective Flotation as Applied to Canadian Ores," and a short account by R. L. Crume of the experimental work being done in the Lochalsh-Goudreau gold field with the Sharpe Radio-Corograph.

Mining in Idaho—The twenty-eighth annual report of the mining industry of Idaho, recently released for distribution, contains 269 pages, and is practically a handbook on mining in Idaho. The report contains much information of value to those interested in mining and milling, as well as concise data on general mining conditions, mining companies operating in the state, and opportunities which the state offers for mineral development. Copies of the report may be had upon request to the Inspector of Mines, Boise, Idaho.

Ontario Publications — The Department of Mines of Ontario, Canada, has issued the following publications: Bulletin No. 46, "Hydro-Electric Development for Metal Mines of Northern Ontario," by A. R. Webster; Part I, Vol. XXXV, Thirty-fifth Annual Report of the Ontario Department of Mines, which contains "Statistical Review of Ontario's Mineral Industry in 1925," by W. R. Rogers and A. C. Young; "Classes for Prospectors," by W. L. Goodwin; "Mining Accidents in Ontario, 1925," and "Mines of Ontario in 1925," both these last-mentioned articles being prepared by T. F. Sutherland, J. G. McMillan, D. G. Sinclair, G. E. Cole, and A. R. Webster; Part VI of the same report, which contains "Ogden, Bristol, and Carscallen Townships," by J. E. Hawley; "McArthur, Bartlett, Douglas and Geikie Townships," by E. L. Bruce; "Grassy River Area, District of Sudbury," by T. L. Gledhill; "Wasapika Section, West Shiningtree Area," by F. L. Finley.

Pneumatic Conveying — "Pneumatic Conveying of Gritty Materials" is discussed by Edward J. Tournier in an 11-page article in *Rock Products* for Jan. 22. (Chicago; price 25c.) Following a discussion of the general principles of pneumatic conveying, high- and low-vacuum and pumping systems are described, with capacities and power requirements. Many illustrations of the various types of equipment are included.

Air Lifts—"The Design of Air Lifts for Water" is theoretically developed in an article by A. L. Egan in the Jan. 8 and Feb. 5 issues of *The South African Mining and Engineering Journal* (Johannesburg; price 6d. each issue). The investigation was made as the result of the writer having been called upon to consider the design of an air lift to pump 700,000 gal. per hour from a depth of 225 ft., at an altitude of 4,000 ft.

Underground Limestone Mining — Bulletin 262 of the U. S. Bureau of Mines, pp. 97, discusses "Underground Limestone Mining." The author, J. R. Thoenen, presents the results of personal visits to and studies of fifty-two underground limestone mines. The bulletin may be obtained for 30c. from the Superintendent of Documents, Washington, D. C.

Electrical Prospecting—The Transactions of the Canadian Institute of Mining and Metallurgy and of the Mining Society of Nova Scotia for 1926 have just been issued in bound form. Four papers on electrical prospecting are of particular interest. These are: "The Swedish Methods," by Hans Lundberg; "The Elbof Method," by E. E. Mueser; "The Schlumberger Method," by Sherwin F. Kelly; and "Electrical Prospecting at the Britannia Mine," by James I. Moore, Jr., and Frank Ebbutt.

Rubber in the Mining Industry—The Bulletin of the Institution of Mining and Metallurgy (Cleveland House, 225, City Road, London, E. C. 1) for March contains 23 pages of discussion of H. P. Stevens' paper on "The Use of Rubber in the Mining Industry."

Mica—The bulletin mentioned in the preceding paragraph also contains a 36-page paper by G. V. Hobson on "Mica and Its Industrial Relationships." This gives the salient facts concerning the occurrence and production of mica, both in the British Empire and foreign countries. Separate copies of the paper may be obtained from the offices of the Institution for 2s. each.

Oil Burners — Many house owners have recently considered installing oil burners in their house-heating furnaces in place of coal firing. They will be interested in U. S. Department of Agriculture Circular 405, by Arthur H. Senner, on "The Domestic Oil Burner" (pp. 30), which is based on tests made by the government of various kinds of burners. Copies are obtainable for 10c. each from the Superintendent of Documents, Washington, D. C.

Firebrick—Users of firebrick will be interested in the seventh edition of a booklet published by the American Refractories Institute, Pittsburgh, Pa., entitled "Brands of Firebrick and Other Refractories, Together With a List of Manufacturers in the United States and Canada." The book seems complete and is a valuable directory of brands and manufacturers of refractory brick.

Fluid Flow and Heat Transfer in Pipes—The School of Mines and Metallurgy, Rolla, Mo., has issued a "Descriptive Bibliography on Oil and Fluid Flow and Heat Transfer in Pipes," by Joe B. Butler, with 370 references to published articles and books. Copies of the bulletin may be obtained on request to the Librarian of the Missouri School of Mines, Rolla, Mo.

Nova Scotia Mining—The Department of Public Works and Mines, Halifax, N. S., has recently published its "Annual Report of the Mines, 1926," pp. 424. The report on gold mining in Nova Scotia, made by T. A. Rickard twenty-one years ago, is reprinted, with later discussion on the same subject. Recent work at individual mines is described in detail.

Pedestal Rocks—"Pedestal Rocks Formed by Differential Erosion" are discussed by Kirk Bryan in U. S. Geological Survey Bulletin 790-A, obtainable on request to the Survey at Washington, D. C. This is supplementary to other papers on this subject and gives additional examples of rocks formed in arid climates by differential weathering.

Personal Notes

Courtenay DeKalb is going to Arizona to make a mine examination.

Charles Henry White, of San Francisco, sailed for Europe on June 23.

Gordon C. Smith, mining engineer, of Boise, Idaho, has been in New York.

J. Samuel Coupal, of Boston, is in Arizona examining the Shawmut mine, in the Winkleman district.

Alan Bateman, professor of economic geology at Yale University, has gone to Alaska on professional business.

Landon F. Strobel, mining engineer, of New York, has gone to Denver and Cripple Creek, Colo., on professional business.

A. John Eveland has ended his connection with the Sierra Mining Co., and is now with Patrick McGovern, Inc., in New York.

Percy E. Barbour sailed on the "Manuel Arnus" on June 22 for a six weeks' pleasure trip in Spain, France, and other European countries.

Richard S. Waite, of Nelson, B. C., is in New York in connection with business connected with Molly Hughes mine of the New Denver, in the Slocan.

Felix Edgar Wormser left New York last Sunday for a five weeks' trip to British Columbia and Alaska, his fourth trip so far this year from coast to coast.

J. T. Becklake, superintendent of the Royal Mint, Pretoria, with Mrs. Becklake and their children, have left Capetown on a six months' holiday to England.

J. H. Crosby, general manager of the J. C. I. Co., Ltd. (Barnato's), with Mrs. Crosby, has left Johannesburg for Capetown en route to England on six months' holiday.

William D. B. Motter, Jr., mining engineer and assistant to the president of the Chile Copper Co., was married to Miss Elsie Louise Catlin, in New York, on June 22.

J. P. Graves, of Spokane, recently passed through San Francisco on his way to the Seven Troughs district in Nevada, where he and his associates are opening an extensive group of claims.

C. F. Kelley, president of the Anaconda Copper Mining Co., returned to New York from Europe on Wednesday, June 22. **John D. Ryan**, chairman of the board, is also returning to New York from the West.

Harry Lindblom, formerly of Stockholm, Sweden, has located in San Francisco as chief engineer of the American Paulin System Co., Inc. Mr. Lindblom was assistant chief engineer of the factory manufacturing Paulin instruments in Sweden.

Dr. E. Kaiser, professor of geology in the University of Munich, has arrived at Capetown and will spend several months in South Africa. After a visit of some weeks in Pretoria, he will tour through South West Africa and the Kalahari.

W. E. Cockfield, of the Dominion Geological Survey, will this season explore and map an almost unknown region in southwestern Yukon, lying between latitude 60 and 61 deg., and about 50 miles west of the White Pass and Yukon Railway.

Prof. J. J. O'Neill, of the consulting geologist's department of McGill University, Montreal, has gone to western Canada, where he will be engaged during the summer in geological work for the Mond Nickel Co. and the Victoria Syndicate.

Major Rothwell-Jackson, director of the Furness Gold Mines, operating in the Porcupine area of northern Ontario, and representing the English interests in the company, has returned from an inspection of the property and other mines greatly impressed with the progress of the mining industries.

W. L. Honnold was given the honorary degree of LL.D. at the recent commencement of Knox University at Galesburg, Ill., in recognition of his engineering work in South Africa and his participation in the services of the commission for Relief in Belgium.

H. H. Webb, formerly consulting engineer to the Consolidated Goldfields, accompanied by Mrs. Webb and their daughter, has been on an extended visit to Johannesburg from America. They left for Capetown on May 5 on their return voyage to England.

H. G. Latilla, mining financier of London, has arrived at Capetown. He is chairman of the Transvaal and Rhodesia Estates, Ltd., and Hendie's Lydenburg Platinum, Ltd., and is also interested in Daggafontein, Henderson's Transvaal Estates, Moodie's (Barberton) G. M. Co., and Sheba G. M. Co., Ltd. Mr. Latilla is on a five weeks' visit to the Union and Rhodesia.

Arthur W. Fahrenwald, expert in ore dressing for the U. S. Bureau of Mines, has been assigned to make an exhaustive study of milling practice in the Michigan copper district, in co-operation with the Michigan College of Mining and Technology at Houghton. He has made a preliminary survey of the stamp mills, and July 1 will return to the district to continue his studies which probably will require two years.

Obituary

Charles Frederic Rand, past president of the American Institute of Mining and Metallurgical Engineers, died at his home in West Orange, N. J., on June 21. He was 70 years of age. Mr. Rand had long been identified with mining operations. His activity in this direction began in 1888 and continued for 32 years. He was the owner of iron mines in the Lake Superior district and manganese mines in Cuba and was also interested in the mining of copper. He was president of the North American Exploration Co., the Moa Bay Iron Co. and the Antimony Corporation of New York, and an officer and director in several other companies. He is credited with the discovery of large soft iron-ore deposits on the north coast of Cuba. From 1891 to 1896 he was manager and treasurer of the Rockefeller mining properties in Washington. In 1902 he organized the Federal Mining & Smelting Co. and effected the consolidation of various lead properties in the Coeur

Charles F. Rand

d'Alene district of Idaho. In 1913 King Alfonso of Spain decorated him with the Grand Cross of Knight Commander of Order of Isabella Catolica. In 1922 he received the cross of Chevalier of the Legion of Honor from the French Government for service during the World War. He was made an honorary member of the Iron and Steel Institute of Great Britain in 1921. Upon this occasion he was in England as honorary secretary of the John Fritz Medal Board of Award, which bestowed the John Fritz medal for achievement in applied science on Sir Robert Hadfield at that time. The following year, in Paris, as secretary of the engineering mission, he presented the John Fritz medal for 1922 to Eugene Schneider, head of the Creusot Works. Mr. Rand also served as president of the United Engineering Society from 1916 to 1920, and as chairman of the executive board of Engineering Foundation. He was a leader in research, holding membership in the National Research Council and in other organizations. He was a member of many clubs and was active in civic and welfare work in the town where he resided. Mr. Rand was born in Canaan, Me. In 1885 he married Miss Mary E. Burnham, of Milwaukee, who died in 1916. He leaves a son and three daughters.

State Senator Charles S. Muffley, prominent in mining for many years and president of the Montana Mining Association, died at Townsend, Mont., on June 2, at the age of 63. Senator Muffley was born at Virginia City, Mont., and for a long time was Democratic leader in the Montana Senate.

Market and Financial News

Chile Copper and U. S. Steel Augment Dividend Total

DIVIDENDS paid by mining companies in June exceeded those of March, the corresponding month of the first quarter, by more than $6,000,000. The biggest factor in the increase was the consequence of the stock dividend of the United States Steel Co. whereby the outstanding shareholding was increased from 5,083,025 to 7,116,235. The rate on the common stock was continued at $1.75 per quarter, so that the about $25,000 less than the amount paid in March, when the rate was $2 per quarter, against the present rate of $1.25. As a consequence of the recent stock dividend the outstanding shareholdings of common have been increased from 206,554 to 309,831. In addition to the half share of common the stockholders were given a half share of a new 6 per cent preferred issue, upon which dividends will be paid

Mining Dividends and Yields for June, 1927

Companies in the United States	Situation	Per Share	Total	Per Cent Annual Yield
American Metal	U. S. and Mex.	$0.75 Q	$445,700	7.4
American Metal, pfd	U. S. and Mex.	1.75 Q	87,500	6.5
American Smelting & Refining, pfd	U. S. and Mex.	1.75 Q	875,000	5.6
Arizona Copper, c	Ariz.	9 d	£57,000	....
Bunker Hill & Sullivan, s, l	Idaho	0.75 M	245,250	9.3
Butte & Superior, z, s	Mont.	0.50 Q	145,099	21.0
Calumet & Arizona Mining, c	Ariz.	1.50 Q	964,135	9.0
Calumet & Hecla Consolidated, c	Mich.	0.50 Q	1,002,751	13.3
Eagle-Picher Lead, z, l	Okla.	0.40 Q	400,000	5.9
Federal Mining & Smelting, pfd., s, l, z	Idaho, Okla.	1.75 Q	210,000	7.5
Federal Mining & Smelting, com.	Idaho, Okla.	10.00 KS	504,000	....
Gladstone Mountain, l	Wash.	0.005 M	6,609	j24.0
Golden Cycle Mining & Red., g	Colo.	0.04 Q	60,000	10.0
Hecla Mining, l, s	Idaho	0.25 Q	250,000	6.8
Homestake Mining, g	S. D.	0.50 M	125,580	j11.1
Inland Steel	Minn.	0.625 Q	739,249	5.0
International Nickel, n, c	Ont., W. Va.	0.50 Q	836,692	2.9
Mohawk Mining, c	Mich.	1.00 Q	115,000	10.0
Mother Lode Coalition, c	Alaska	0.25 S.A.	625,000	....
National Lead	U. S.	1.25 Q	387,289	5.0
National Lead, pfd	U. S.	1.75 Q	426,433	5.3
Nevada Consolidated Copper	Nev., Ariz., N. M.	0.375 Q	1,315,959	10.4
Republic Iron & Steel	U. S.	1.00 Q	300,000	5.9
St. Joseph Lead, l, z	Mo., N. Y.	0.75 XX	1,462,821	7.8
Sloss-Sheffield Steel & Iron	Ala.	1.50 Q	150,000	4.6
Tennessee Copper & Chemical	Tenn.	0.125 Q	99,328	5.8
Texas Gulf Sulphur	Texas	1.00 Q	2,540,000	6.8
Tintic Standard, s, l, c	Utah	0.40 Q	461,166	j15.0
U. S. Steel	U. S.	1.75 Q	12,453,411	5.7
United Verde Copper	Ariz.	3.00 KR	900,000	....
Utah Copper	Utah	1.50 Q	2,436,734	5.3
Companies in Other Countries				
Chile Copper	Chile	0.625 Q	2,744,528	7.1
Hollinger Consolidated Gold	Ont.	0.10 F	492,000	6.7
Lake Shore, g	Ont.	0.20 X	200,000	....
Lucky Tiger-Combination, g, s	Sonora	0.05 M	35,767	9.2
McIntyre-Porcupine, g	Ont.	0.25 Q	199,500	4.8
Total			$34,142,501	

s, silver; l, lead; z, zinc; c, copper, g, gold; n, nickel; t, tin; Q, quarterly; M, Monthly; BM, bi-monthly; K, irregularly; F, every four weeks; SA, semi-annually; j, based on dividends for the last twelve months; X, 10c. regular quarterly and 10c. extra; XX, 50c. regular quarterly and 25c. extra; KR, irregular, this dividend paid in May, but not included in May list; KS, irregular, paid on ending of injunction proceedings.

gross disbursement was increased by upward of $3,000,000. A second reason for the swelling of the total is the fact that Chile Copper paid its regular quarterly dividend at the rate of $2.50 annually, in June, whereas the March distribution was deferred until April and consequently did not enter into the March total.

Mother Lode Coalition, a semi-annual payer, is represented this month; but on the other hand Keeley Silver is absent, because its interval is six months and the last payment was in March. Other names that are not in the June list are St. Mary's Mineral Land, California Rand, Mond Nickel, and Patino Mines & Enterprizes. These companies have no fixed policy, but pay as their financial condition and the general outlook warrant. Patino paid 1s. in May as the final disbursement on income of 1926. The dividend paid by National Lead on its common shares aggregated in February, May, August and November. Lake Shore paid an extra of 10c. in addition to the regular quarterly dividend of 10c. The Arizona Copper Co., Ltd., the British investment company that holds an interest in the Phelps Dodge Corporation, paid 9s. Tennessee Copper & Chemical reduced its quarterly rate from 25c. to 12.5c.

Noranda Mines, Ltd., will increase its capital stock from 2,000,000 to 2,250,000 shares of no par value. The new shares will be offered to the present stockholders in order to raise funds for the completion of the construction program and the acquisition of new properties. Control of the Waite-Montgomery and Alderson-McKay properties has been taken over from the Timmins interests. In some quarters it is believed that the Timmins-Hollinger group now dominate Noranda affairs.

Statistical Notes

Great Northern Iron Ore Properties, holding company of sundry iron-mining shares, reports for the year 1926 gross receipts amounting to $2,323,708. Of this $2,250,000 was paid as dividends. Current assets as of Dec. 31 were $1,695,920.

Rio Tinto Co., Ltd., reports for the year 1926 revenue of £1,317,862 after deducting taxes, administration costs, and other expenses, compared with £1,381,417 in 1925. The reserve fund was increased by £500,000 and dividend distributions for the year totaled £1,018,750. This reduced the balance to revenue from £481,153 to £153,448.

Callahan Zinc-Lead Co. during the first quarter of 1927 mined about 12,700 tons of ore and shipped 1,191 tons of concentrates. Income was $92,781 and costs and expenses were $72,377, leaving a surplus of $20,403.

Federal Mining & Smelting Co. is free to pay the dividend of $10 per share on its 50,400 outstanding shares of common stock, according to a decision just handed down by the courts of New Jersey. In deciding in favor of the mining company in the injunction proceedings brought by H. Content & Co., Chancellor Wolcott stated that the 1925 balance sheet of the corporation shows an excess of assets above the amount of outstanding preferred stock. This excess, he said, is more than equal to the amount of the $10 dividend. The fact that the 1925 balance sheet shows an excess of assets in this connection, he points out, is enough in itself to warrant refusal of a permanent injunction against payment of the dividend. In refusing to enjoin the company from carrying out its policy of paying out one-half of its annual net profits remaining after all charges except depletion, and after payment of preferred dividends, as a dividend on common stock, the Chancellor said the company may very well carry out that policy without in any way injuring the rights of preferred stockholders as safeguarded by State Corporation Act.

Iron Mines in Michigan according to L. P. Barrett, appraiser for the Tax Commission, are valued at a total of $99,784,000 in 1927, against $100,272,550 for 1926. The mines of the four districts are valued as follows: Dickinson, $4,488,000; Iron, $22,647,000; Gogebic, $40,417,000; Marquette, $32,232,000.

During 1926 Dickinson County mined 1,172,457 tons and shipped 1,459,790; Iron mined 4,339,247 and shipped 4,486,587; Gogebic mined 5,761,345 and shipped 6,428,754; Marquette mined 3,973,874 and shipped 4,435,029. The total was 15,246,932 tons mined and 16,810,160 shipped. State and local taxes paid by the Michigan operators in 1926 amounted to $3,679,316, or $0.2413 for each ton of ore mined.

May Was "Black Month" for European Zinc, Says Sharpe

May was a black month in the European zinc industry and gave both ore producers and smelters much to think about, according to A. J. M. Sharpe, honorary foreign correspondent of the American Zinc Institute. The month opened with prompt shipment selling at £29 7s. 6d. and closed with this position commanding £28 7s. 6d. Just before the end of the month, however, May shipment sold as low as £27 17s. 6d. and August delivery at £28.5s. This chanced to be the turning point, and at time of writing, June 7, prompt had stiffened to £28 17s. 6d. and the three-months' position was priced at £28 18s. 9d.

Mr. Sharpe estimates world stocks of zinc on June 1, 1927, in metric tons as follows:

Estimate of World's Zinc Stocks

United States	38,100
Canada	2,400
Australia (including unsold shipments afloat)	2,800
Germany-Poland	6,300
Belgium	3,000
France	1,200
Great Britain	1,100
Scandinavia	200
Far East	500
Elsewhere	1,500
Total	57,100

If the course of the St. Louis market during May, continues Mr. Sharpe, is studied, it will be found that the slump at that center had much to do with the weakness in London, and that immediately rates hardened at St. Louis the London market benefited accordingly. Indeed, markets in all the principal base metals have taken a turn for the better in the last ten days, and not only is sentiment stronger but actual business is on a much-improved scale.

Though it is true that Europe is now producing slab zinc on a higher scale than at any time since 1914, it will be appreciated from the situation of stocks that consumption has also gained and is today taking care of not only the European output but also of the quantities of high-grade zinc imported from North America and from Australia. The high-grade is particularly favored by the brass trade.

It is considered unlikely that the European output of common zinc will be further advanced until there is another lift upward in consumption. It must be borne in mind that the majority of smelters in Europe are dependent upon purchased ores for their raw requirements, these being mainly supplied under long-period contracts, with the price based on the ruling monthly averages of slab zinc in London. For this reason the forcing of the zinc market to an unprofitable level would carry its own corrective, just as in the case of the Tri-State field and the St. Louis selling price of metal. In other words, when the ore producer is unable to dispose of his output profitably he will suspend or curtail operations, which in turn would soon be reflected in a lessened production of metal. Speaking generally, a selling price of £29 per ton in London is regarded as the lowest point at which the general run of ore producers and smelters find it profitable to operate, so that whenever the market is below that level the output of both ore and metal is likely to be affected.

The British production of slab zinc was 4,200 long tons in May, but this, of course, originated wholly from Australian concentrates, which are supplied to the various British smelters on specially favored price terms; were this not so, it is unlikely that any smelter would be operating in Great Britain today.

So greatly are the Continental smelters undesirous of enlarging their existing ore commitments that the returning charge has been raised by at least £1 per ton of concentrates, with the result that fresh business is on the smallest possible scale because sellers of ore do not see their way to accept the revised terms.

The British galvanizing industry is enjoying a fair business, so that the British consumption of slab zinc is by no means unsatisfactory. On the Continent a fair amount of zinc is used by the rolling mills, which complained of the dearth of fresh bookings a fortnight ago, but which are now stated to be in a much happier position in this respect. The brass trade is also picking up a little, so that the consumption outlook in Europe is, all things considered, satisfactory.

Germany and Belgium Penalized in Continental Steel Entente

THE agreement creating the Continental Steel Entente was signed Sept. 30, 1926, by representatives of the steel industries of Germany, France, Belgium, Luxemburg, and the Saar. The provisions went into effect on Oct. 1, 1926. Later the Czechoslovak, Austrian, and Hungarian steel industries adhered to the terms of the entente. Their actual participation began on Jan. 1, 1927.

According to the agreement, each country pays into a common fund $1 each month for each ton of raw steel effectively produced. Each country is assigned a quota, which is fixed quarterly by a committee consisting of four representatives of each of the participating countries. In order to make any change in the quota a majority vote of three-fourths of the members is required. If the quarterly production of a country surpasses the quota set for it during any quarter, it is required to pay into the common fund $4 for every ton produced in excess of its allotment. If the production of any country falls below its quota, it receives $2 from the common fund for each ton in deficit of its quota, not to exceed 10 per cent of the tonnage allotted. According to the agreement, the first liquidation of this fund, covering the first quarter's operation, from Oct. 1, 1926, to Jan. 1, 1927, was made on April 1, 1927.

A study of the entente by the National Industrial Conference Board indicates that for this quarter the quota of the entire entente was set at 7,332,000 metric tons, or at the annual rate of 29,287,000 metric tons. Of this quota 43.17 per cent was allotted to Germany, 31.19 per cent to France, 11.56 per cent to Belgium, 8.30 per cent to Luxemburg, and 5.78 per cent to the Saar region. The actual production for the first quarter of operation was 7,922,000 metric tons. Three areas—Germany, Belgium and the Saar—exceeded their tonnage, whereas France and Luxemburg failed to produce their quota. The total excess production of the three countries overproducing amounted to 696,00 metric tons; the deficit for the two that did not reach their quota was 96,000 tons.

The balance sheet of the liquidation of the first quarter's operation under the agreement is given in the accompanying table.

Balance sheet* of the Continental Steel Entente, October-December, 1926

Country	Collections of $1 per Month per Ton Levy	Overproduction Fines ($4 per Ton)	Rebates for Underproduction ($2 per Ton)	Total Collections (†)	Repayments to Members (‡)	Profits to Members	Losses To Members
Germany	$3,736,000	$2,300,000	.....	$6,036,000	$4,540,000	.....	$1,496,000
France	2,197,000	.....	$172,000	2,025,000	3,280,000	$1,255,000	.....
Belgium	937,000	346,000	.....	1,301,000	1,215,000	.....	86,000
Luxemburg	598,000	.....	20,000	578,000	870,000	292,000	.....
Saar	454,000	120,000	.....	574,000	609,000	35,000	.....
Total	$7,922,000	$2,784,000	$192,000	$10,514,000	$10,514,000	$1,582,000	$1,582,000

*No account is taken of deductions for administrative purposes.
†Sum of $1 per ton levy, plus fines for overproduction, or minus rebates for underproduction.
‡Total distributed in proportion to tonnage quota allotments.

According to the terms of the agreement, both the $1 charge and the $4 per ton fines go into a common fund. This fund, after payment of administrative expenses, which are small in proportion to the total collection, and the subsidies to countries that underproduce, is returned to each country in proportion to its quota. On this basis the $1 per ton charge amounts really to a deposit. The only real penalty that can be said to act as a restraint to overproduction is not the actual payment of the $4 fine but the proportion of this that will be retained due to the $2 subsidy for underproduction.

As may be seen from the table, the penalty inflicted upon Germany and Belgium for overproduction amounted in the first quarter to about 40c. and 10c. a ton respectively. The comparative inability of any producer to forecast the actual rate at which this $4 per ton fine will be collected apparently is the real restraining factor tending to keep the several members in line with the production program laid down by the entente.

The Market Report

Metal Prices Show Little Change—Sales Below Current Production Rates

New York, June 22, 1927—The week ending today has been a quiet one in the non-ferrous metal markets. Copper has sold in better volume than for two weeks, but the total business has not been large. Prices are steady. Lead has been somewhat quieter, with prices about the same as last week. Zinc has been in reasonably good demand. Silver has declined a half cent during the week, and the minor metals are substantially unchanged, though quicksilver is perhaps a shade easier. Most of the statistical services report only a very little slowing up in industrial activity, and expect an active fall and winter, but metal sellers in general have found things very slow recently.

Copper Still 12½c., Valley

Copper sales in the week ending today have improved considerably over the business of the two weeks preceding but have continued below normal and there is still no sign of any important buying movement. Some groups continue out of the market, quoting nominally 12⅝ or 12¾c. for Eastern deliveries, but there are several sellers, and have been all week, at 12½c., at which price all the sales have been made so far as Connecticut buyers are concerned. However, on Monday copper was obtained for delivery at one of the higher freight-rate points at the same price, though ordinarily an eighth of a cent premium is charged. Deliveries were well distributed over June, July and August, though one sale was made for as far ahead as November, at 12½c. Wire mills have bought a little more liberally, though the wire business continues unsatisfactory, it is said.

On Tuesday, June 21, the export association reduced its foreign price from 13.10 to 13c., without, however, stimulating much business, the markets abroad being as quiet as here.

Producers are apparently holding firm at current levels, and there seems no pressure to cut prices to obtain business in any direction.

Zinc Holds Around 6.20c.

Practically no change has occurred in the zinc market this week. The metal has been in good demand from galvanizers, with the volume of sales about up to average. Most of the business has been at 6.20c., with scattering sales at 6.175, 6.225, and 6.25c. June and July shipment has been in greatest demand. High-grade is unchanged, spot carloads being offered at 8c., delivered in the East.

Lead Quiet But Steady

Though the lead market has been quiet, particularly in the East, prices have been firm all week. If anything, sentiment is better as a consequence of the issuance of the May statistics, which showed a continuation of the decline in production recorded in April. Compared with March, the last previous 31-day month, production has declined nearly 11,000 tons. United States, Mexico, and Spain were the largest contributors to the curtailment. The preponderance of opinion seems to be that the present price has had the effect of discouraging production sufficiently to reverse the recent climb of stocks at smelters and refineries. The American Smelting & Refining Co. has continued its official contract price in New York at 6.40c., and it is doubtful if this price has been cut during the week. On the contrary, some small sales have been made at 6.45c. In St. Louis, second-hands sold a little lead at 6.10c. during the early part of the market week, but sales also were made at 6.125c. and 6.15c. each day Yesterday and today 6.15c. has been the prevailing price. Ore lead from Mexico continues to go abroad, and the market in London appears to be absorbing it at firm prices.

Little Change in Tin

Prompt Straits tin has fluctuated between 67⅛ and 67⅞c., with today's price slightly higher than that of a week ago. Spot metal is scarce both here and in London. This is reflected in the wide backwardation, which amounts to about £12 in Europe. A squeeze, due to the speculative position, is not improbable in spot metal in London, and this may be reflected in higher prices on this side. Buying on the part of domestic consumers cannot be called active, but

Daily Prices of Metals

June	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St. L.	St. L.
16	12 275	64 00	67 75	6.40	6.125@6.15	6 20
17	12 275	64.25	67 875	6 40	6 125@6.15	6 175@6 20
18	12 275	64 125	67 75	6.40	6 125@6.15	6 20
20	12.175@12.275	64 375	67.75	6 40	6.125@6 15	6 20@6 225
21	12 275	64 25	67 50	6.40	6 15	6.20@6 225
22	12.275	64 75	67 875	6.40	6.15	6.175
	12 267	64 292	67 750	6 400	6 142	6 198

Average prices for calendar week ending June 18, 1927, are: Copper, 12.279; 99 per cent tin, 64.000; Straits, 67.771; N. Y. lead, 6.400; St. L. lead, 6.144; zinc, 6.221; and silver, 56.854.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries: tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis: i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

June	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
16	53 13/16	54 7/16	60	294½	286	23 15/16	24¼	28¾	28⅝
17	53⅞	54 9/16	59¾	295½	286⅞	24⅛	24 7/16	28 9/16	28 7/16
20	53⅞	54½	60	296¼	286	24⅛	24 7/16	28 9/16	28 7/16
21	53¾	54⅜	59¾	295⅞	285½	24 1/16	24⅜	28½	28 7/16
22	53¾	54⅜	59¾	298½	286¼	24¼	24½	28 7/16	28 5/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

June	Sterling Exchange "Checks"	Silver		Gold London	June	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
16	4.85¼	56⅞	26 7/16	84s11½d	20	4 85⅛	56¼	26 1/16	84s11½d
17	4.85¼	56½	26⅛	84s11½d	21	4 85⅛	56¼	26	84s11d
18	4.85⅛	56½	26⅛	.....	22	4 85⅛	56½	26 1/16	84s11½d
					Avg.		56.479		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forencon. Cables command one-half cent premium.

there is some inquiry for both Straits and 99 per cent. July Straits is almost 2c. under prompt.

Lire Advanced

Except for a moderate strengthening of Italian lire, foreign exchanges have changed little during the week. Closing cable quotations on Tuesday, June 14, were as follows: francs 3.91½c.; lire 5.62c., and marks 23.70c. Canadian dollars ¼ per cent discount.

Silver Declines, Then Rallies

Apparently as the result of speculative operations against yen, silver declined during the past week until the 22nd, when a moderate rally occurred. Buying by China was responsible for the advance, although India also improved its rates, and the market closed steady.

Mexican Dollars (old Mexican pesos): June 16th, 43⅜c.; 17th and 18th, 42⅞c.; 20th and 21st, 42⅝c.; 22nd, 42¾c.

Other Metals

Quotations cover large wholesale lots unless otherwise specified. London prices are according to latest mail advices.

Aluminum—Per lb., 98 or 99 per cent grade, price of leading interest, 26c.; outside market, 25.30@25.80c. London, 98 per cent, £104@£106 per long ton for domestic consumption. Foreign metal unsettles British market.

Antimony—Per lb., duty paid, New York: Chinese brands, range for the week, spot business at 12¼@12½c. August arrival about ¼c. higher. Shipments from China are reported to be small. Cookson's "C" grade, spot, 18c. Market dull. Needle antimony nominally 8c. for lump and 10c. for powdered. White oxide, 16½c.

Bismuth—Per lb., New York, in ton lots, $2.20@$2.25. London, 8s.

Cadmium—Per lb., New York, 60c. London, 1s. 10d. for Australian metal.

Iridium—Per oz., $110@$112 for 98 @99 per cent sponge and powder.

Nickel — Per lb., ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade) for single lots of spot metal. London, £170@£175 per long ton, according to quantity.

Palladium—Per oz., $55@$57. Small lots bring up to $60. Pure metal as a constituent of crude platinum, nominal. London, £11 to £12, nominal.

Platinum—Official price quoted by the leading interest on small miscellaneous orders for refined metal, $72. Open market cash sales of large lots, in New York, $65@$67. Pure metal as a constituent of crude platinum, nominal at $62.

London, £14½ per oz. for refined and £13½ for crude. Nominal.

Quicksilver—Per 76-lb. flask, $114.50 @$116.50. Dull and easier. Resale lots at lower price. San Francisco, $117.33. London, £20@£21.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tellurium, Thallium, Tungsten, and Zirconium** are unchanged from the issue of June 4.

Zinc Blende Price Higher—Lead Ore Unchanged

Joplin, Mo., June 18, 1927

Blende	
High	$43.40
Premium Blende, basis 60 per cent zinc	$41.00@42.00
Prime Western, basis 60 per cent zinc	40.00
Fines and slimes, 60 per cent zinc	36.00@39.00
Average settling price, all zinc	38.23
Galena	
High	$82.10
Basis 80 per cent lead	78.00
Average settling price, all lead	81.01

Shipments for the week: Blende, 5,240; lead, 1,026 tons. Value of shipments for the week, $283,090.

The following is compiled from four weekly reports of the Tri-State Zinc and Lead Ore Producers' Association:

Mills Operating	May 14	June 4	Decrease
Mine mills	104	75	29
Tailing mills	28	31	(Inc.) 3
Total mills	132	106	26

Over the period of four weeks the following averages are drawn:

29 tailing mills produced	5,140 tons
89 mine mills produced	41,400 tons
Total	46,540 tons

The average output per week was: mine mills, 116 tons; tailing mills, 35 tons.

An estimated production this week of 7,200 tons, together with the above figures, illustrate the extent to which a drastic restriction of output has been forced by low prices. The average estimated weekly production was 15,316 tons in 1926.

Platteville, Wis., June 18, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$42.00
Lead Ore	
Lead, basis 80 per cent lead	$80.00

Shipments for the week: Blende, 1,245 tons; lead, none. Shipments for the year: Blende, 31,244; lead, 840 tons. Shipments for the week to separating plants, 2,681 tons blende.

Metallic Ores

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian (washed), 53@55 per cent, 38@40c. Business dull. Chemical grades unchanged from quotations in the June 4 issue.

Tungsten Ore — Per unit of WO_3, N. Y.; Wolframite, $10.50; Western scheelite, $11. Dull; prices nominal with weaker tendency.

Chrome, Iron, Molybdenum, Tantalum, Titanium, Uranium, and Vanadium Ores are unchanged from quotations in the June 4 issue.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the June 4 issue.

Mineral Products

Arsenious Oxide (White Arsenic)—3¾c. per lb. Quiet. London, Cornish white, per long ton, £16.

Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate and Zinc Oxide are unchanged from prices in the June 4 issue.

Ferro-Alloys

Ferrochrome—Per lb. of contained chromium, 60@70 per cent chromium, 4@6 per cent carbon, 11½c.

Ferromanganese—Domestic and foreign, 78@82 per cent, $90 per long ton, furnace or duty paid. Consumers well covered for early needs. Spiegeleisen, 19@21 per cent, $36@$37, f.o.b. furnace; 16@19 per cent, $34.

Ferrotungsten—96@98c. per lb. of W contained, f.o.b. works. Market very dull.

Ferrocerium, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferro-uranium and Ferrovanadium are unchanged from prices in the June 4 issue.

Metal Products

Rolled Copper—Sheets, 21½c.; wire, 14⅝@14¾c. f.o.b. mill.

Lead Sheets—Full rolled, 10c. per lb.; clipped, 10½c.

Nickel Silver—28⅝c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Dimension sheets, 18⅝c. per lb.; rods, 15⅝c.

Zinc Sheets—9¾c. per lb., f.o.b. mill.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the June 4 issue.

Increase in Steel Buying Predicted

Pittsburgh, June 21, 1927

Demand for steel continues to taper off, but at a very mild rate, below that at this time in previous years. Production is at fully 80 per cent, or at only about 10 per cent under the record rate of last March. As buying has been for prompt shipment, this is a good indication. Mills have little backlog business to lose. An increase in buying is now predicted for about Sept. 1.

Demand is widespread among the consuming industries and takes the form of very small orders at a time.

Steel prices are holding very well, irregularities prevailing in the past couple of months not having spread. Sheets and strips are very firm at recently advanced asking prices.

Pig Iron.—The valley market is a trifle more active, but may still be considered dull. Prices are not overly firm. Bessemer, $19; basic, $18; foundry, $18.50.

Connellsville Coke.—The spot market is a trifle steadier, quotations remaining at $2.85@$3 for furnace and $4@$4.75 for foundry. Third-quarter furnace coke is available at $3.25. There is little demand. One or two furnaces may buy byproduct coke instead of Connellsville.

Current Prices of Mining Supplies

Rise and Fall of the Market

PRICE of galvanized steel sheets is higher than a month ago at Pittsburgh mills. Almost all other iron or steel materials used in mining tend downward. Those particularly affected by the present direction of demand are, railway spikes, structural shapes, wire nails, and c.-i. pipe. Pine and fir mine timbers are firmer in the West; while manila rope prices appear lower than in May, at Chicago. Paint materials show declining tendencies. Linseed oil is off 1½c. per gal. this week at Minneapolis, following the drop of ¾c. per lb., f.o.b. New York, in red and white lead, effective June 16.

SHEETS—Quotations are per 100 lb. in various cities from warehouse also the base quotations from mill:

	Pittsburgh, Large Mill Lots	St. Louis	Chicago	San Francisco	New York
Galvanized No. 24	$3.85	$5.25	$4.80	$5.25	$4.95

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots:

	Pittsburgh			
	Current	One Year Ago	Birmingham	Chicago
Standard bessemer rails	$43.00	$43.00	$43.00	$43.00
Standard openhearth rails	43.00	43.00	43.00	43.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh					
	Current	One Year Ago	Chicago	St. Louis	San Francisco	Birmingham
Standard spikes, ⅝-in. and larger	$2.80	$2.80	$3.55	$3.65	$3.85	$3.00
Track bolts	3.90–4.25	3.90@4.15	4.55	4.60	5.35	3.90
Standard section angle bars, splice bars or fish plates	2.85	2.75@2.80	3.40	3.75	4.00	....

STRUCTURAL MATERIAL—Following are base prices in carload lots, f.o.b. mill, Pittsburgh and Birmingham together with quotations per 100 lb. in less than carload lots, from warehouses at places named:

	Pittsburgh, Mill	Birmingham Mill	New York	Dallas	St. Louis	Chicago	San Francisco
Beams, 3 to 15 in.	$1.75@1.90	$2.05	$3.34	$4.15	$3.25	$3.10	$3.00
Channel, 3 to 15 in.	1.75@1.90	2.05	3.34	4.15	3.25	3.10	3.00
Angles, 3 to 6 in., ¼ in. thick	1.75@1.90	2.05	3.34	4.15	3.25	3.10	3.00
Tees, 3 in. and larger	1.75@1.90	2.05	3.34	4.15	3.35	3.10	3.00
Plates ¼-inch thick	1.75@1.90	1.95	3.34	4.15	3.25	3.10	3.00

WIRE ROPE—Discounts from list price, f.o.b. New York and east of Missouri River, on regular grades of bright and galvanized are as follows:

Cast steel round strand rope	20%
Galvanized steel rigging and guy rope	7½%
Round strand iron and iron tiller	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Galvanized iron rigging and guy rope	+12½%

	New York	Cleveland	Chicago
DRILL ROD (from list)	60%	55%	50%

WROUGHT IRON AND STEEL PIPE—The following percentage discounts are to jobbers for carload lots at Pittsburgh mill:

	Steel			Iron		
	Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD	1 to 3	62	50½	1 to 1½	30	13
LAP WELD	2½ to 6	59	47½	3 to 6	28	13

WROUGHT-STEEL PIPE—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
2½ to 6 in. lap welded	48%	51%	46%

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York					
	Current	One Year Ago	Birmingham	Chicago	St. Louis	San Francisco
6 in. and over	$47.60	$51.60@53.60	$38.00 base	$44.20	$43.60	$52.00

NUTS—Hot pressed or cold punched, square or hexagonal, blank or tapped, full kegs or cases, discount 50-10% from new list April 1, 1927 at warehouses in New York and vicinity.

HOLLOW TILE—Price per block in carload lots to contractor for hollow building and partition tile.

	New York						Perth Amboy
	Current on Trucks‡	One Year Ago	Chicago	Philadelphia	St. Louis	San Francisco‡	N. J., Factory
4x12x12	$0.1027	$0.1112	$0.076	$0.11	$0.068	$0.108	.....
6x12x12	.1541	.1667	.104	.....	.09	.156	$0.2388*
8x12x12	.1926	.2084	.142	.21	.126	.244	.2956†

* 10x12x12; † 12x12x12. ‡ Partition tile.

MACHINE BOLTS—Square heads and nuts, up to 1x30-in., full kegs or cases, discount 50% from new list April 1, 1927 at warehouses in New York and vicinity.

LUMBER—Prices of rough Douglas Fir No. 1 common, in carload lots to contractors at yards in San Francisco.

	6-8 and 12 Ft.	10-16-18 and 20 Ft.	22 and 24 Ft.	25 to 32 Ft
3x3 and 4	$26.00	$27.00	$28.00	$31.00
3x6 and 8	26.00	27.00	28.00	31.00
4x4-6 and 8	26.00	27.00	28.00	31.00

Wholesale prices to dealers of long-leaf, yellow pine (rough) timbers. To contractors in New York City, delivered from lighters to job, $5@$10 additional.

	New York		Chicago	
	20 Ft. and Under	22-24 Ft.	Up to 20 Ft., Pine	Up to 32 Ft., Fir
3x4 to 8x8	$40.00@42.00	$41.00@43.00	$38.50	$40 50
3x10 to 10x10	47.00@49.00	48.00@50.00	45 00	40 50
3x12 to 12x12	54.00@56.00	55.00@57.00	56.00	40 50

Other Cities	8 x8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Pine	Fir*	Hemlock	Spruce	Pine	Fir*
Boston	$48.00	$48.50†	$50.00	$52.00	$58.00	$58 50†
Cincinnati	37.00	73 00	73 00	85 00	48.00	77.00
Denver	....	33 25	34 25	34.25	....	34 25
Minneapolis	44 50	38.75	34.50	.....	47 00	39 75
Kansas City, Mo.	41 50	39.75	....	....	55 50	39.75
Philadelphia	48.00	36.00	38.00	45.00	62.00	36.00

*Douglas fir. † Prime.

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh, Mill	Chicago	San Francisco	Dallas	St. Louis	Montreal
Wire	$2.50	$2.95	$3.35	$4.25	$2.83	$4.95
Cut	2.80	....	5.00	5.00	2.93	5.00

PORTLAND CEMENT—Prices to contractors per bbl. in carload lots *without bags*. Cash discount not deducted.

	Current	One Month Ago	One Year Ago
New York, del. by truck	$2.35@2.50	$2.35@2.50	$2.50@2.60
Chicago, f.o.b.	2.05	2.05	2.10
Cleveland, f.o.b.	2 24	2.24	2.29

LIME—Warehouse; New York quotes bbl. 280 lb. net; Chicago, 180 lb.:

	Hydrated, per Ton		Lump, per Barrel	
	Finishing	Common	Finishing	Common
New York	$18.20	$11.00	$3.50	$2.10@$3.00
Chicago	20.00	18.00	....	1.50

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrel (5 bbl. lots)	$0.89½	$0.84	$0.90	$0.85

WHITE AND RED LEAD—In 100-lb. kegs, base price in cents per pound:

	Dry		In Oil	
	Current	1 Yr. Ago	Current	1 Yr. Ago
Red	13.75	15.25	15.25	16.75
White	13.75	15.25	13.75	15.25

HOSE—Quotations at New York warehouses:

Fire Protection — 50-Ft. Lengths
Underwriters' 2½-in. coupled, single jacket (net) ..... $0.68 per ft.

Air—Best Grade
¼-in., per ft. ..... 3 ply $0.34 4 ply $0.42

Steam—Discounts from List
First grade ..... 40% Second grade ..... 40–5% Third grade 50%

RUBBER BELTING—List price 6-in., 6 ply, $1.83 per lin.ft. for rubber transmission belting.
Best grade ..... 50% Second grade 50–10%

LEATHER BELTING—List price, 24c. per lin.ft. per inch of width for single ply at New York warehouses:

Grade	Discount from list
Medium	40–5%
Heavy	30–10%

PACKING—Prices per pound:

Rubber and duck for low-pressure steam, ¼ in.	$0.95
Rubber sheet	50
Rubber sheet, wire insertion	.80

MANILA ROPE—Per lb., ¼-in. and larger, 1,200-ft. coils.

Atlanta	$0.27	New Orleans	$0.21
New York	.24½	Seattle	.23
Chicago	.23	San Francisco	.22½

EXPLOSIVES—Prices per pound of dynamite in small lots:

	Gelatin	
	40%	60%
New York	$0.265	$0.2875
Minneapolis	.1917	2123
Denver	.2025	2275
Seattle	.165	.19
Cincinnati	.22	.245
San Francisco	.1625	.1925

FLOTATION OIL—Pine tar, 50 gal. bbl., gross weight 500 lb., f.o.b. New York, carload lots, per gal. $0.35

CHEMICALS—Prices f.o.b. producing point, per lb.:

Zinc dust, 550 lb. casks	$0.10½@.11
Litharge, casks	.09
Sodium cyanide, 220 lb. single case lots	.18@.22
Calcium carbide, in drums	.05@.06

Mining Stocks—Week Ended June 18, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	45⅜	44⅞	45	Ap.16,May21 Q	0.75
Arcadian Consol.	Boston	*30	*30	*30		
Ariz. Com'l	Boston	6¼	5⅞	6	Ja. 7, Ja. 28	0.50
Calaveras	N. Y. Curb			1⅜		
Calumet & Arizona	New York	66½	65¼	65¼	Ju. 13, Ju. 20 Q	1.50
Calumet & Hecla	Boston	15¼	15	15	My.31, Jn.15 Q	0.50
Cerro de Pasco	New York	60	59⅞	60	Ap. 14, My. 2 Q	1.00
Chile Copper	New York	35⅛	34⅛	34⅛	Jn.3, Jn.30, Q	0.62½
Con. Coppermines	N. Y. Curb	2⅜	2⅜	2⅜		
Copper Range	Boston	12⅛	12	12	Ap.2, My.2, A	1.00
Crystal Copper	Boston Curb	*60	*45	*50		
East Butte	Boston	1⅜	1⅛	1⅛	Dec., 1919	0.50
Granby Consol	New York	39⅛	36⅛	36⅜	Jn.15 Jy. 1 Q	1.00
Greene-Cananea	New York	45⅛	44⅛	45	Nov., 1920	0.50
Howe Sound	New York	39⅛	37⅜	38⅛	Apr.1,Apr.15 Q	1.00
Inspiration Consol	New York	14⅛	14⅜	14⅛	Ma.17, Ap.4, Q	0.25
Iron Cap	Boston Curb	3	2⅜	2⅛		
Isle Royale	Boston	10⅛	9⅛	9⅛	Fe.4, Fe.19, Q	0.50
Kennecott	New York	63⅛	62⅛	62⅜	Ju. 3, Jy. 1 Q	1.25
Magma Copper	New York	36⅛	36⅛	36⅛	Jn.30, Jy.15, Q	0.75
Mason Valley	N. Y. Curb	1⅛	1	1		
Miami Copper	New York	14⅛	14⅛	14⅛	My.2,My.16 Q	0.37½
Mohawk	Boston	40	39⅛	40	Ap.30, Jn.1 Q	1.00
Mother Lode Coal	New York	3	2⅜	3	Jn.10, Jn.30	0.25
Nevada Consol	New York	14⅛	13⅛	13⅛	Jn. 3, Jn. 7 Q	0.37½
New Cornelia	Boston	20⅛	19⅛	20	My.6, My.23 Q	0.50
Noranda	N. Y. Curb	22⅛	21⅛	21⅛		
North Butte	Boston	1⅛	1	1	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*94	*59	*92	Sept. 1926	0.03
Old Dominion	Boston	12	11⅜	11⅞	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb	114	114	114	Ma.22, Apr.2 Q	1.50
Quincy	Boston	16	15⅛	15⅛	March, 1920	1.00
Ray Consolidated	New York	15	15	15	Ap.20, Ap. 30	0.25
St. Mary's Min. Ld.	Boston	22⅛	21⅛	21⅛	Fe.10, Ma.10	2.00
Seneca Copper	New York	3⅛	3	3		
Shattuck-Denn	Boston Curb	3⅜	3⅛	3⅜		
Tenn. C. & C.	New York	8⅛	8⅛	8⅛	My.31,Ju.15, Q	0.12½
United Verde Ex.	N. Y. Curb	23⅛	23⅛	23⅛	Apr.6, May1 Q	0.75
Utah Copper	New York	115	115	115	Jn. 17, Jn. 30 Q	1.50
Utah Metal & T.	Boston	1⅛	1 1/16	1 1/16	Dec., 1917	0.30
Walker Mining	Salt Lake	*57	*50	*50		
NICKEL-COPPER						
Internat. Nickel	New York	69⅛	63⅜	66⅛	Jn. 16, Jn. 30 Q	0.50
Internat. Nickel pfd.	New York			105	Ap. 14, My. 2 Q	1.50
LEAD						
Gladstone Mtn	Spokane	*24⅜	*23⅛	*23⅛	April, 1927	0.005
National Lead	New York	103	99⅛	100⅜	Jn. 10,Jn.30 Q	1.25
National Lead pfd.	New York	132⅛	132	132	My.10,Jn.15 Q	1.75
St. Joseph Lead	New York	38⅛	38	38⅛	Se.10,Se.20, QX	0.75
ZINC						
Am. Z. L. & S.	New York	8	7⅛	7⅛	May, 1917	1.00
Am. Z. L. & S. pfd.	New York	46⅛	45	46	Nov., 1920	1.50
Butte C. & Z.	New York	4⅛	4⅛	4⅛	De. 9, De. 24	0.50
Butte & Superior	New York	9⅛	8⅞	8⅛	Jn. 17, Jn. 30 Q	0.50
Callahan Zn-Ld	New York	1⅛	1⅛	1⅛	Dec., 1920	0.50
Consol.Lead&Zinc'A'	St. Louis	12⅜	12⅜	12⅜	Ma.15, Ap.1 Q	0.25
Eagle-Picher	Cincinnati	27	26⅜	26⅛	Au.15,Se.1 Q	0.40
Eagle-Picher pfd.	Cincinnati			116	Jn.30, Jy.15 Q	1.50
New Jersey Zn	N. Y. Curb	182	178	180⅛	Jn.20, Jy.9 QX	2.00
United Zinc	N. Y. Curb			*55		
Yellow Pine	Los Angeles	*29	*20	*29	Dec. 1925 Q	0.04
GOLD						
Alaska Juneau	New York	1	1	1		
Argonaut	Toronto	*39⅛	*27	*31⅛		
Barry-Hollinger	Toronto	*35	*33	*33⅛		
Consol W. Dome L.	Toronto	*7⅞	*6	*6⅛		
Cresson Consol. G.	N. Y. Curb	2⅜	2 1/16	2⅛	Ma.31,Ap.10 Q	0.10
Dome Mines	New York	7⅛	7⅛	7⅛	Jn.30, Jy. 20 Q	0.25
Golden Cycle	Colo.Springs	†1.65	†1.64⅛		My.31, Jn.10 Q	0.04
Hollinger Consol	Toronto	19.90	19.60	19.80	Jn. 1, Jn. 17	0.10
Homestake Mining	New York	62⅛	61⅛	62⅛	Jn. 24, Jn. 25 M	0.50
Kirkland Lake	Toronto	1.40	1.30	1.39		
Lake Shore	Toronto	19.80	19.50	19.50	Jn.1, Jn.1 X	0.20
McIntyre-Porcupine	New York			25	My.2, Jn.1 Q	0.25
Portland	Colo.Springs	†*40	†*38⅛		Ap.6, Ap.15, Q	0.02
Rand Mines	New York			9⅛	Au.23-30 Am.Sh.	1.52
Teck-Hughes	Toronto	7.99	7.60	7.70	Ja.31, Fe.1	0.05
Tom Reed	Los Angeles	*39	*35	*38	Dec., 1926	0.02
Tough-Oakes	Toronto	*55	*50	*51		
United Eastern	N. Y. Curb	*35	*35	*35	July, 1924	0.05
Vipond Cons	Toronto	1.02	*90	*90	Apr.1, Apr.15	0.03
Wright-Hargreaves	Toronto	5.90	5.70	5.85	Ap.15,My.2	0.10
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	13¼	12	13¼		
Con. Cortez	N. Y. Curb			*19		
Con. Virginia	San Francisco	*2⅛	*2⅛	*2⅛		
Dolores Esperanza	N. Y. Curb			*51	July, 1923	0.05
Premier Gold	N. Y. Curb	2	2	2	Jn.14, Jy. 5	0.08
Tonopah Belmont	N. Y. Curb	1⅜	1⅜	1⅜	Ma.15, Ap.4	0.08
Tonopah Extension	N. Y. Curb			*28	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb			2⅛	Ma.31, Apr.21	0.07½
West End Consol	N. Y. Curb			*10	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*45	June, 1918	0.02
SILVER						
Beaver Consol	Toronto	1.08	1.04	1.06	May, 1920	0.03
Canadian Lorrain	Toronto	*25	*21	*22		
Castle-Trethewey	Toronto	*84	*83	*83		
Coniagas	Toronto	3.50	3.20	3.50	May, 1924	0.12½
Keeley	Toronto	1.31	1.26	1.28	Fe.28, Ma.15 X	0.12
Lorrain Trout Lake	Toronto	*80	*75	*80	July, 1925	0.05
McKinley-Dar.-Sav.	Toronto	*16⅛	*16	*16⅛	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.30	3.25	3.30	Jn. 29, Jy.15	0.12½
Nipissing	N. Y. Curb	5¼	5⅛	5⅛	Jn.30, Jy.20	0.07½

Stock	Exch.	High	Low	Last		Last Div.
SILVER-LEAD						
Ahumada	New York	3⅛	3	3⅛	Ma. 25,Ap.4	QX 0.12½
Bingham Mines	Boston	46	45⅛	45⅛	Ma.21, Ap. 5	Q 1.00
Bunker Hill&Sullivan	N. Y. Curb	100	96	98⅛	My.31, Jn.4	X 0.75
Cardiff M. & M.	Salt Lake	2.70	2.50	2.50	Feb. 5, 1927	0.10
Chief Consol	Salt Lake	1.51	1.45	1.45	Nov., 1926	Q 0.10
Consti'nMng.&Mill'g	Spokane	*31	*25	*25		
Erupcion	Boston Curb			*49	Ma. 25, Ap. 2	Q 0.07½
Eureka Lily	Salt Lake	1.50	1.45	1.45		
Federal M. & S.	New York	187	159	170	Jn.25, Jn.29	Spec. $10
Federal M. & S. pfd.	New York	97	94	94	My.25, Ju.15	Q 1.75
Hecla Mining	N. Y. Curb	14⅞	14⅛	14⅛	My.4, Ju. 15	Q 0.25
Highland-Surprise	Spokane	*10⅛	*10	*10⅛		
Iron King Mining	Salt Lake	*55	*50	*50		
Keystone Mining	Salt Lake	*25	*25	*25	Au. 12, Au. 26	0.07½
Lucky Jim	Spokane	*19⅛	*19	*19		
Lucky Tiger-Com.	Kansas City	†7.00	†6.75		Jn.10, Jn.20	0.05
Mammoth Mining	Salt Lake	1.85	1.85	1.85	Jn.10, Jn.20	Q 0.05
Marsh Mines	Spokane	1⅛	1	1		
North Lily	Salt Lake	3.62½	3.25	3.62½		
Park Utah	New York	6¼	6⅛	6⅜	Jn. 25, Jy. 1	Q 0.20
Plutus Mining	alt Lake	1.85	1.85	1.85	Ja. 10, Ja. 15	Q 0.10
San Rafael	San Francisco			*24		
Silver King Coal.	Salt Lake	7.80	7.80	7.80	Jn. 20, Jy. 1	0.25
Silversmith	Spokane	*39	*38	*38	Oct., 1926	Q 0.02
Stratton Mines	Spokane	*50	*45	*49		
Sunshine M. Co.	Spokane	*81	*79	*81		
Tamarack-Custer	Spokane	*31⅛	*29	*30	Sept., 1924	0.25
Tintic Standard	Salt Lake	11.37½	11.00	11.12½	Jn.15, Jn.28	0.40
Utah-Apex	Boston	4⅛	4⅛	4⅛	Oct., 1926	0.25
IRON						
Bethlehem Steel	New York	50	49⅛	49⅛	July, 1924	1.25
Cleveland-Clifis Iron	Cleveland	84	83	83	Ja. 15, Ja. 25	Q 1.00
Colorado Fuel & Iron	New York	89⅛	83⅛	89⅛	May, 1921	0.75
Gt. North'n Iron Ore	New York	19⅛	18⅛	19	Dec. 6, Dec. 28	0.75
Inland Steel	New York	51	47⅛	50⅜	My. 13, Jn. 1	Q 0.62½
Replogle Steel	New York			12⅛		
Republic I. & S.	New York	67¼	66	66	My. 14, Jn. 1	Q 1.00
Republic I. & S. pfd.	New York	105	103⅛	105	Jn. 14, Jy. 1	Q 1.75
Sloss-Sheffield S. & I.	New York	126⅛	123⅛	126	Jn. 10, Ju. 20	Q 1.50
Sloss-Shef. S.&I. pfd.	New York			107⅛	Jn. 20, Jy. 1	Q 1.75
U. S. Steel	New York	123	111⅛	121⅛	Jn. 7, Jn. 29	Q 1.75
U. S. Steel, pfd.	New York	133⅛	132	133	My.2, My.28	Q 1.75
Virginia I. C. & C.	New York	45	45	45	Jan., 1924	1.50
Virginia I.C.&C. pfd.	New York			60⅛	Ju. 15, Jy. 1	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York			30⅛	Ja. 26, Ja. 29	1.45
So. Am. G. & P. New.	N. Y. Curb	3	3	3		
Alum. Co. of Amer.	N. Y. Curb	81	79	80		
Alum. Co. ofAmer.pf	N. Y. Curb			104	Jn. 15, Jy. 1	Q 1.50
Vanadium Corp.	New York	48⅛	46⅛	48	My. 2, My. 16	Q 0.75
Patino M. & E.	New York	21⅞	21	21	Ap. 27, My. 5	1 sh.
ASBESTOS						
Asbestos Corp.	Montreal	24⅛	23	23⅛	Jan., 1926	1.50
Asbestos Corp. pfd.	Montreal	90	88⅛	89⅛	Ma.31, Ap.15	Q 1.75
SULPHUR						
Freeport, Texas	New York	74	68⅞	69⅛	Jy. 15, Au.1	QX 1.25
Texas Gulf	New York	66⅛	61⅛	64⅛	Ju. 1, Ju. 15	Q 1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	40⅛	40⅛	40⅛	My. 20, Ju. 1	Q 0.75
Amer. Metal, pfd.	New York	108⅛	108	108	My. 21, Ju. 1	Q 1.75
Amer. Sm. & Ref.	New York	161⅛	155	159⅛	Jn.8, Au. 1	Q 2.00
Amer. Sm. & Ref. pfd.	New York	125	125	125	Au. 1, Se. 1	Q 1.75
Consol. M. & S.	Montreal	245⅞	242	242	Jn. 30, Jy. 15	X 6.25
Newmont Mining	N. Y. Curb	80⅛	73	80	Ma.31, Ap.15	Q 0.60
U. S. Sm. R. & M.	New York	36	35⅛	36	Ap. 7, Ap. 15	Q 0.87½
U.S. Sm. R.&M. pfd.	New York	49⅛	48⅛	49⅛	Ap. 7, Ap. 15	Q 0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED JUNE 7, 1927

Name	High	Low	Last	Date	Last Div. Amount
Aramayo Mines (25 frs.)	89/3	86/10½	88/9	May, 1927	5 p.c. (†)
British Platinum (£1)	3/3	2/7½	3/—	Feb., 1925	2½ p.c.
Burma Corpn. (10 rupees)	15/—	14/7½	14/10½	Feb., 1927	6 annas*
Bwana M'Kubwa (5s)	5/9	5/4½	5/6		
Camp Bird (2s)	4/3	3/3	3/3		
El Oro (£1)	4/3	4/—	4/3	Nov., 1924	2½ p.c.*
Esperanza (10s)	—/1½	—/1½	—/1½		
Frontino & Bolivia (£1)	13/9	12/6	13/9	Jan., 1927	5 p.c.
Mexican Corpn. (£1)	10/9	10/3	10/9		
Mexico Mines of El Oro (£1)	17/6	15/7½	17/6	Dec., 1926	3¾ p.c.*
N'Changa Copper Mining	11/6	10/9	11/6		
Oroville Dredging (£1)	6/—	5/9	6/—	Dec., 1923	3¾ p.c.
Ouro Preto (£1)	2/—	1/—	1/—	May, 1925	2½ p.c.
Rhodesian Congo Border (£1)	57/6	55/—	55/—		
St. John del Rey (£1)	11/3	11/—	11/—	May, 1927	3¾ p.c.
San Francisco Mines (10s)	32/3	31/3	31/9	Jan., 1927	25s.
Santa Gertrudis (£1)	17/7½	17/—	17/3	Jan., 1927	3¾ p.c.
Selukwe (2s. 6d.)	8/6	8/—	8/6	April, 1917	6¼ p.c.
S. Amer. Copper (2s.)	3/3	2/10½	3/—	Nov., 1917	75 p.c.
Tanganyika (£1)	60/9	47/6	51/3	Aug., 1926	7½ p.c.
Union Miniere du Haut-Katanga (Brussels)	9.500	9.350	9.350	July, 1926	175 (‡)

* Free of British income tax. † Swiss frs. ‡ Belgian frs. and free of taxation.

New Machinery and Inventions

The ease with which this cutter works facilitates the slotting

Commutator Slotting Machine Is Driven by a Motor

For undercutting the mica between the commutator bars of a motor or generator, the motor-driven machine illustrated herewith is the latest development of the Martindale Electric Co., Cleveland. Various screws and nuts are provided to regulate and maintain the slot depth. The handle of the device is hollow so that a compressed-air line may be used for blowing the mica away from in front of the saw and thus enable the operator to see the work clearly at all times.

Self-Cleaning Air Filter

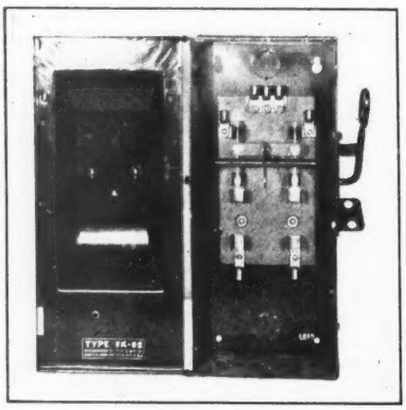
Adaptation of the Midwest principle of air cleaning to the self-cleaning type of filter has been announced by Midwest Air Filters, Inc., Bradford, Pa. This clean-air filter consists of a sheet-metal housing inclosing the filter chain. The filter consists of demountable cells which are arranged in an endless chain. The manufacturer states that a positive air seal and air lock have been developed at all points of contact within the chain, as well as between the filter chain and the housing.

A sediment drawer is provided at the bottom of the tank to accumulate dirt. This drawer can be removed and the dirt emptied when convenient. The filter can be bolted directly to a wall or partition. The filter chain is built on the impingement principle, with a viscous substance used on the cells. Operation may be on a continuous or an intermittent basis. The filter chain is driven by a ¼-hp. motor with a speed-reduction unit and a silent-chain connection.

The air flow is through both sides and the top of the filter and the direction of flow may be through the duct opening or vice versa. These filters are supplied in standard units with rated capacities of 10,000 to 25,000 cu.ft. per minute. Units may be arranged in multiple to obtain any desired capacity within reason.

Two-Pole, Three-Wire Switches Require Small Space

Two-pole switches, with a solid third wire, for use on three-wire grounded systems, have been developed recently by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. They may be obtained in sizes varying from 30 to 600 amp. Their design provides an economic switch arranged to utilize the advantages of reduced size. This decrease is made possible by the use of a solid third wire which eliminates the third switch blade. The size is thus reduced to that of a standard two-wire switch.



This pole switch is economical of space

The 30-amp. switch is of the "00" type, the 60-, 100- and 200-amp. sizes are of the WK-62 type, and the 400- and 600-amp. sizes of the WK-60 type. When it is desired to mount a meter in conjunction with the switch, all the types up to 200 amp. may be supplied with a solid or removable end.

Tapered-Roller Bearings for Transmission Applications

Completion of its line of power transmission equipment by the addition of a line of equipment provided with Timken roller bearings has been announced by the Medart Co., Potomac and De Kalb Sts., St. Louis, Mo. This addition consists of four units: A spherical ball-and-socket pillow block, a ball-and-socket hanger bearing of the dumb-bell or hourglass type for lineshafts, a unit mounting for incorporation into machines, and special mountings or special equipment, and a loose pulley for lineshaft and countershaft usage, according to the manufacturer.

The general construction as described by the manufacturer is as follows:

The Medart unit comprises two tapered-roller bearings, assembled on a sleeve of ground steel tubing to form one unit and fitted into a finished cast-iron hub. This hub is machined to fit into a suitable housing adapted for use in the spherical ball-and-socket pillow block, the unit mounting for building into duplicate machinery, or the loose pulley. The steel sleeve is slotted at each end and is held tight on the shaft by steel clamping collars.

Lubricant is forced into the races of the roller bearings through Alemite-Zerk fittings. Grease seals are placed in the flanges at the ends of the bearing to prevent dust from entering or lubricant leaking out. The large ends of the rolls point inward or toward the center of the bearing, which assures lubricant being pumped away from instead of toward the end inclosures, it is stated.

Catalogs

Anti-Friction Bearings — A leaflet dealing with the advantages of ball bearings on motors has been distributed by the New Departure Manufacturing Co., Bristol, Conn.

Conveyors—"Handling Things From Where They Are to Where You Want Them" is the title of Book No. 575, on elevators and conveyors, published by the Link-Belt Co., 300 West Pershing Road, Chicago.

Diesel Engines—A booklet conveying in a brief manner the construction and operating characteristics of vertical solid injection Diesel engines has been published by the De La Vergne Machine Co., New York, N. Y.

Fire Trucks—A bulletin announcing La France mine fire trucks has been published by the Mine Safety Appliance Co., Braddock Ave. and Thomas Boulevard, Pittsburgh, Pa.

Hoists — A complete line of floor-operated electric hoists is described in an illustrated descriptive catalog announced by the Shepard Electric Crane & Hoist Co., of Montour Falls, N. Y.

WAUGHDRIFTER

Model Seventeen the Recognized Leader

For all tunnel driving projects, the Waugh Model Seventeen is now recognized as the leading rock drill.

It is not merely by accident that it has been selected on such projects as the Moffat, Chelan, Hetch Hetchy, Cascade, Milton Bowman, and many similar contracts.

If you are contemplating any tunneling operations it will pay you to investigate the performance of this fast, dependable machine.

BULLETINS ON REQUEST

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FOREIGN

CANADA
The Canadian Rock Drill Co., Ltd.
Montreal, Cobalt, Nelson
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ENGLAND
The Denver Rock Drill Mfg. Co.
London, E. C. 2.

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Noyes Bros, Pty., Ltd.,
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SOUTH AFRICA
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Tokyo

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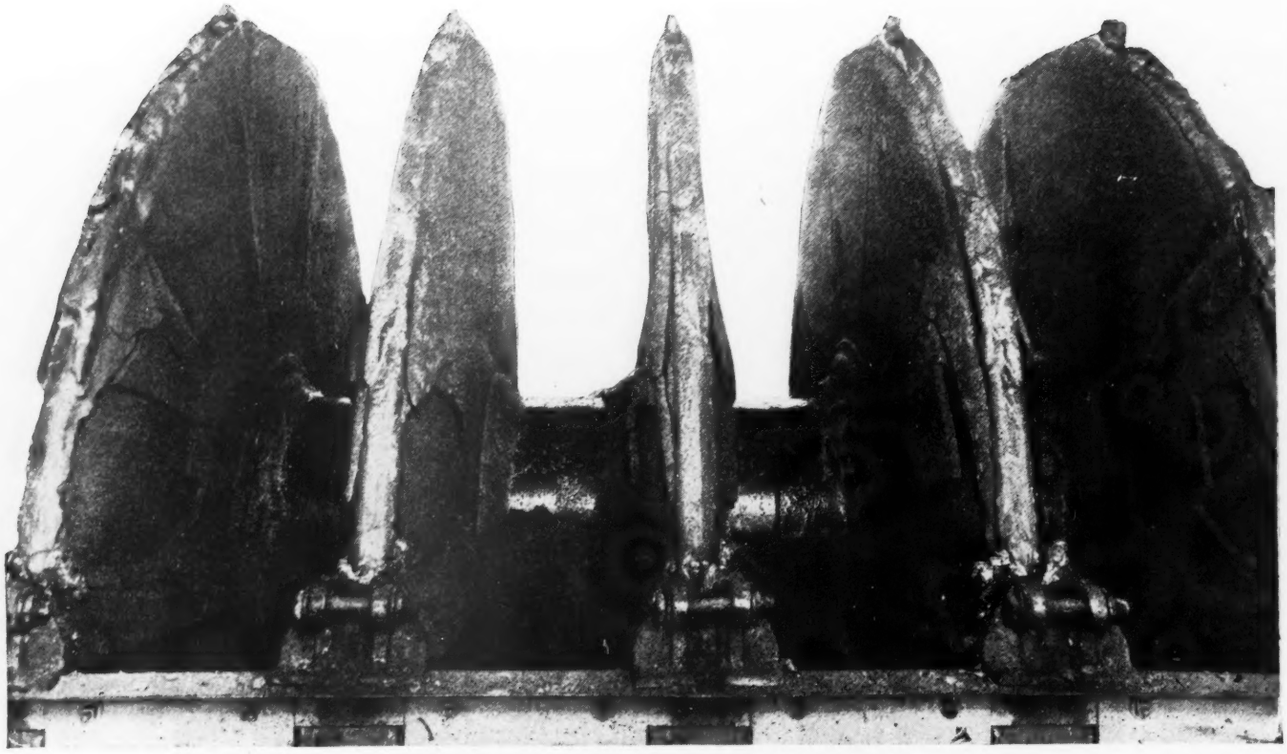
ROCK WAUGH DRILLS

THE DENVER ROCK DRILL
MANUFACTURING COMPANY
DENVER COLORADO



American Filter Discharging Concentrates

Reports for cloth life on slimes indicate 180 days is being obtained; on concentrates, the life varies according to materials filtered and operating conditions. In one custom mill, handling several different products on a battery of American Filters, cloth life ranges between 1½ and 4 months. Under perfect conditions, even longer life could be expected.

Why Cloth Life Is Long

TWO actions—wearing and rotting—tend to make any cloth break prematurely. Counteract both and cloth life will be reasonably normal.

With American Continuous Filters, wearing is reduced to a minimum by three factors—free and clean discharge of cake, accurately timed deflation of the cloth and flexible rubber aprons that lift off patches of cake that might stick.

Rotting is retarded by the complete discharge of free liquid from each sector as it rotates past its zenith. And by the reduction or elimination of chemical treatment of cloths to free the pores.

When American Filters are installed, long cloth life goes with them.

Three Distinct Advantages Regarding American Filters

Long cloth life.

High washing efficiency

Low "per ton cost" for installing and operation.

UNITED FILTERS CORPORATION

Main Office and Laboratory: Hazleton, Pennsylvania

New York Chicago Salt Lake City Los Angeles

Export Office: 25 Broadway, New York Code Address: Unifilter, New York

A proven rotating water stoper SULLIVAN "DU-48"

FOUR YEARS of consistent service in many mines have proven the effectiveness of the Sullivan Rotating Water Stopers—

In drilling speed and power.

In laying the dust "at the source."

In ease of handling.

In air and repair economy.

In adaptability to any mining conditions "DU-48" Water Stopers are acknowledged favorites.

Turns—as it Feeds—as it Drills —as it Lays the Dust

The action of the "DU-48" is as nearly automatic as any drill can be. After the water jet has been set to give the proper flow to the steel, lay the dust at the back of the hole, the runner controls this stoper by the one hand throttle, governing striking speed and rate of feed at the same time.

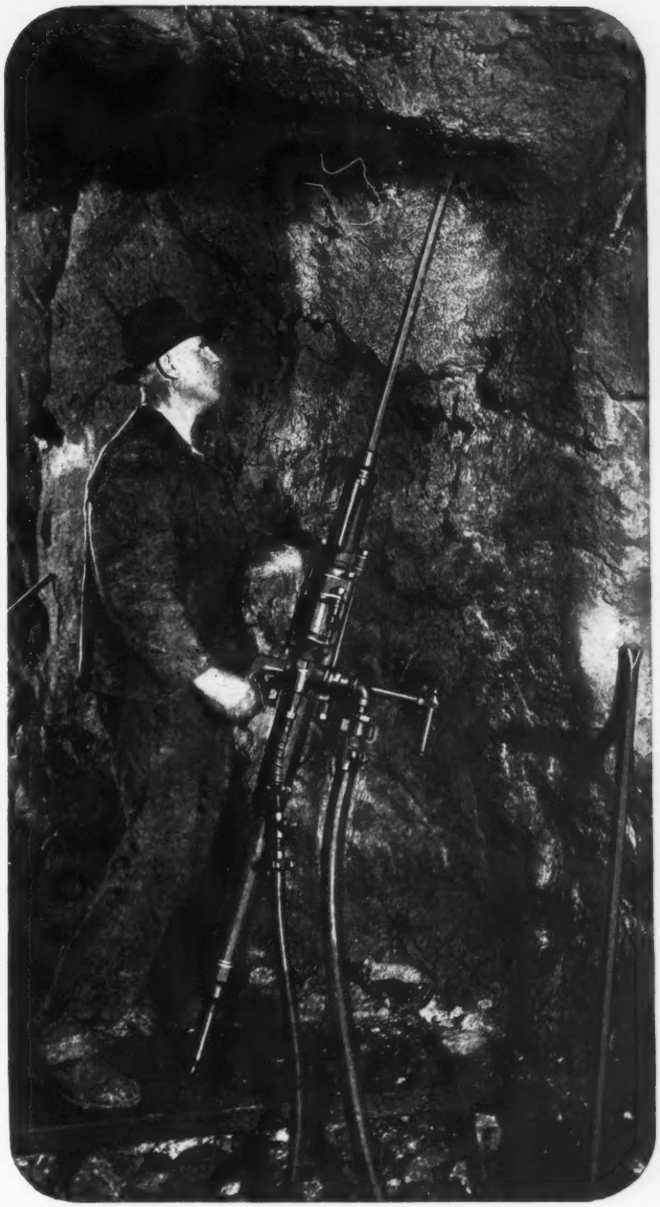
Distinctive Sullivan finger control gives perfect flexibility in advancing the steel. Rotation is automatic and positive, so is lubrication.

"DU-48" handles 1¼-inch steel readily.

Compared with hand rotated stopers, "DU-48" has paid for itself in raising a 3-compartment shaft 27 feet. Two sets per two foot of ore or 30 cents per ton is another way to figure the saving. Repair figures are low. Ask to see them.

"DU-48" weighs 102 lb., is 55-in. long, with feed pistons on it.

The best way to learn what "DU-48" will do for you is to try one. Ask our nearest branch office to send you one.



Sullivan "DU-48" Self-rotating Water Stoper in a Butte Copper property which has bought several hundred of these drills over a period of three years

Bulletin 281-G on request.

COMPRESSORS · AIR LIFT · COAL CUTTERS · DIAMOND CORE DRILLS · ROCK DRILLS
PORTABLE HOISTS · DRILL SHARPENERS AND FURNACES · BUSTERS · SPADERS

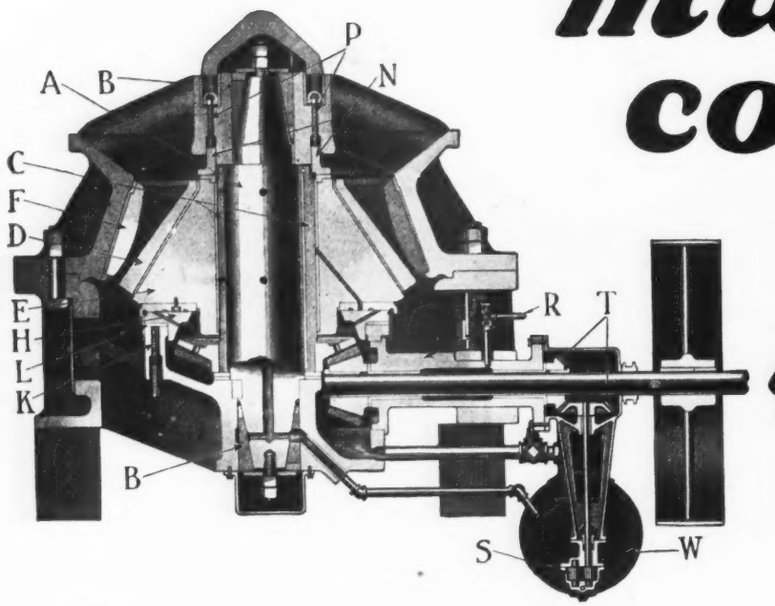
SULLIVAN TRADE MARK

MACHINERY COMPANY

NEW YORK LONDON PARIS TOKYO SYDNEY

126 SOUTH MICHIGAN AVENUE, CHICAGO, ILL., U. S. A.

What goes in must come out



Sectional view of Telsmith Reduction Crusher. A—Central shaft, hollow bored, with taper bushings (B). C—Sleeve eccentric with die-cast babbitt sleeves. D—Manganese steel head mantle, zinced on grey iron core casting (E). Head is adjusted by raising head support (H) by means of two jackscrews (K) inserting or removing shims (L). F—Manganese steel wearing plates. N—Oil sleeve. Kept snug against upper head plate by tightener screws (P). R—Removable countershaft box, equipped with die-cast babbitt bushings and adjustable sight feed. S—Gear pump, driven by steel miter gears (T) lubricated by oil bath from countershaft box. W—Oil storage tank, equipped with removable cover-casting, brass strainer and drain plug.

Telsmith's greater discharge diameter permits a choke, gravity feed

A crusher cannot crush any faster than it feeds. But what goes in must come out—or the crusher will soon choke. Successful secondary crushing demands not only a free, vigorous feed but a speedy, efficient discharge.

Notice Telsmith's head and concaves. They are flared outward at the bottom. There's where and why Telsmith is *different*—it has a larger discharge diameter. The enormous circumference of Telsmith's discharge circle offsets the necessary reduced width of the discharge vent.

That's why Telsmith's big, open hopper takes a choke feed of very coarse rock without hand feeding or mechanical control. That's why you can bury Telsmith twenty feet deep in rock, if you want to, and Telsmith will carry on. Keep the feed clean, free from fines, and Telsmith will discharge the aggregate as fast as it feeds, by unregulated gravity—*without clogging*.

Details of Telsmith construction, its twelve big, exclusive improvements, the unique guarantee back of it, are given in Bulletin 2F1 (Telsmith Reduction Crusher) and Catalog 168 (Telsmith Primary Breaker). Gladly sent without cost or obligation.

TELSMITH

SMITH ENGINEERING WORKS, 84 Capitol Drive, Milwaukee, Wis.
(Formerly Lake Blvd.)

Canadian Representative, Canadian Ingersoll-Rand Co., Montreal, P. Q.

18 E. 41st St., New York, N. Y. | Old Colony Bldg., Chicago, Ill. | 806 Otis Bldg., Philadelphia, Pa. | 80 Federal St., Boston, Mass. | Beckwith Mchy. Co. Pittsburgh, Pa. | The Geo. F. Smith Co. St. Louis, Mo.

General Agents for Western States: Mine & Smelter Supply Co., Denver, Salt Lake, El Paso.

R.C. 10

Drill Runners might be Angels

SOMETIMES everything in the world seems divided up into sheep and goats—Goods and Bads.

And on occasions the Bads seem to have a majority—a landslide in every state in the Union.

Even saintly drill runners in periods of despondency feel their own badness—and the badness of everything.

That's the omen to turn to Red Star Drill Steel—a hunch that by its steady dependability Red Star will turn things right around bright side up for you.

And it's a good sign that you find Red Star stocked in every mining center. So handy, you know.

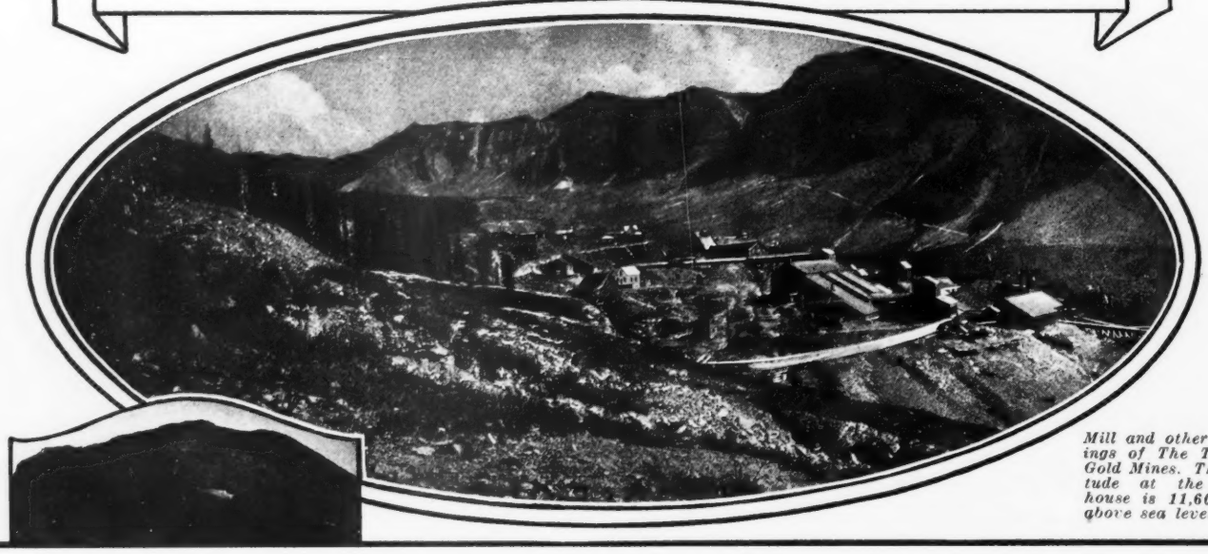
Try to find a place you can't get it. Try to find a rock Red Star won't sink a hole in quicker, easier—and with less resharpening.

COLONIAL STEEL COMPANY

Pittsburgh Boston New Haven New York Philadelphia Cleveland Detroit
Cincinnati Chicago St. Louis Denver Salt Lake City Phoenix

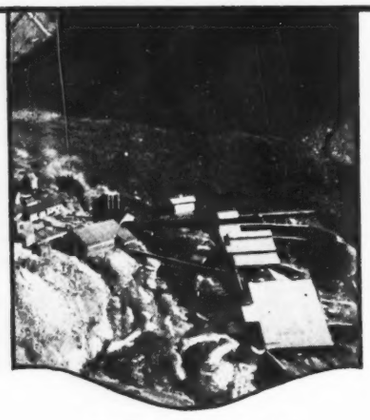
RED STAR
DRILL STEEL

125 TH YEAR OF LEADERSHIP



Mill and other buildings of The Tomboy Gold Mines. The altitude at the shaft house is 11,600 feet above sea level.

A Twenty-three Year Service Record



Surface buildings of The Tomboy Mines. There are about 30 miles of underground workings.

ON NOVEMBER 15th, 1904, the Tomboy Gold Mines Co., Ltd., placed its first order with the du Pont Company for 25,000 blasting caps. From that day, these famous gold mines in the Telluride, Colorado, district, have been supplied entirely with du Pont Explosives and blasting accessories and *serviced* by du Pont exclusively. Twenty-three years of "prompt, efficient and courteous treatment," in the words of the general manager, Mr. N. S. Kelsey. It's a record significant of all the principles and policies maintained by E. I. du Pont de Nemours & Co. since its establishment just one hundred and twenty-five years ago.

The Tomboy Gold Mines, discovered in 1882, are among the oldest in this country. The present company, incorporated June 7th, 1899, succeeded The Tomboy Gold Mining Company, a Colorado corporation. These mines have paid over $10,000,000 in dividends.

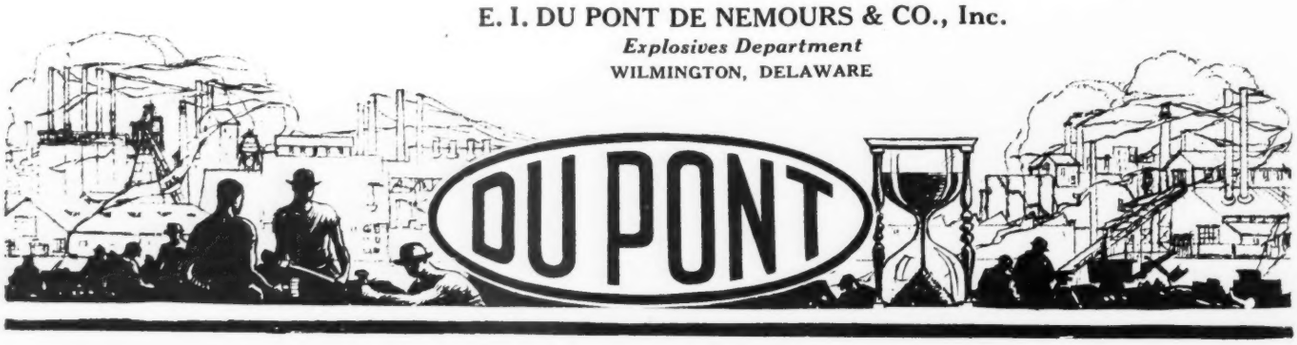
With the strident competition and swift changes now prevalent, the action of The Tomboy Gold Mining Company is significant. Furthermore, such action evidences confidence in the quality and performance of du Pont explosives, an assurance of ample supplies and the rendering of prompt, efficient and practical service by explosives experts whenever necessary.

Powder train on one of the trails in the Telluride District.

E. I. DU PONT DE NEMOURS & CO., Inc.

Explosives Department

WILMINGTON, DELAWARE



Get the Muck Out!

THE speed at which muck can be moved after it is drilled and shot is the deciding factor in the rate at which mine workings can be driven.

Two men with a 6-HC "Little Tugger" Hoist, a scraper, and a slide, can "slush" into cars from 20 to 30 tons per hour, four times as much as by hand.

By "slushing" you can double the speed of driving workings and decrease your costs. 6-HC "Little Tuggers" can also be used in many other ways.

Why not discuss your "slushing" problems with one of our representatives?

INGERSOLL-RAND COMPANY—11 BROADWAY, NEW YORK CITY

Offices in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited, 10 Phillips Square, Montreal, Quebec

119-LTH

Ingersoll-Rand

Permanent Alignment

The alignment problem disappears when pulleys are mounted on Timken Bearings. They permit utmost precision in the original assembly and they maintain it despite the heaviest belt-lash. For Timkens fully withstand thrust and shock as well as greater radial load.

Protection against all elements of wear, friction included, results from Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS*, and Timken-made electric steel. Under all conditions there is entirely self-contained rolling motion in simple, compact, drip-proof mountings. Maximum savings of power and lubricant are certain.

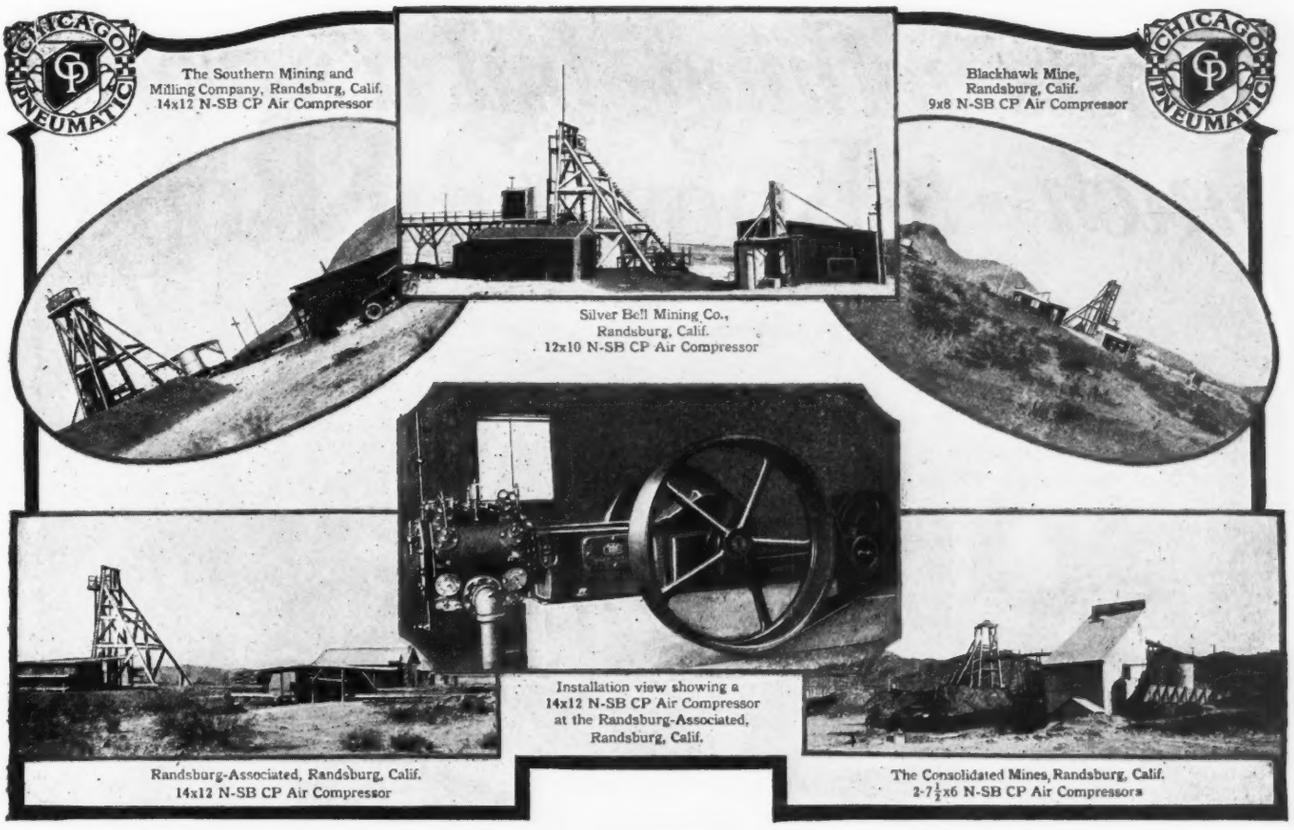
These are the qualities for which Timken Tapered Roller Bearings are incorporated into compressors, pumps and engines by such manufacturers as the Pennsylvania Pump & Compressor Company.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN

Tapered

ROLLER BEARINGS


The Southern Mining and Milling Company, Randsburg, Calif. 14x12 N-SB CP Air Compressor
Blackhawk Mine, Randsburg, Calif. 9x8 N-SB CP Air Compressor
Silver Bell Mining Co., Randsburg, Calif. 12x10 N-SB CP Air Compressor
Installation view showing a 14x12 N-SB CP Air Compressor at the Randsburg-Associated, Randsburg, Calif.
Randsburg-Associated, Randsburg, Calif. 14x12 N-SB CP Air Compressor
The Consolidated Mines, Randsburg, Calif. 2-7½x6 N-SB CP Air Compressors

CP Air Compressors Prove Their Efficiency

IN the little town of Randsburg, with less than 1,000 people, 7 CP Single-Stage Compressors are proving their merit.

Randsburg is only one of the many places where CP Compressors are in great demand because of their ability to operate continuously, delivering air at the lowest cost per cubic foot.

The Single-Stage CP Compressors built in sizes ranging from 67 to 1189 cu.ft. per minute, embody all the mechanical refinements found in the larger types, such as the Simplate Valves with large effective area, permitting high volumetric efficiency with low power consumption. Automatic regulation and self-lubrication assure continuous, dependable service. Read in the box at the left what one of our many users thinks of the CP Compressors and then write our nearest branch for complete information.

What Users Say Counts Most

"Some five years ago, we purchased from you one of your 12 x 10 air compressors. This machine has run continually since having been installed in 1921 and has given us entire satisfaction. Therefore, we can cheerfully recommend your compressors to anyone that is in the market for such equipment."

Photostatic copy furnished on request.

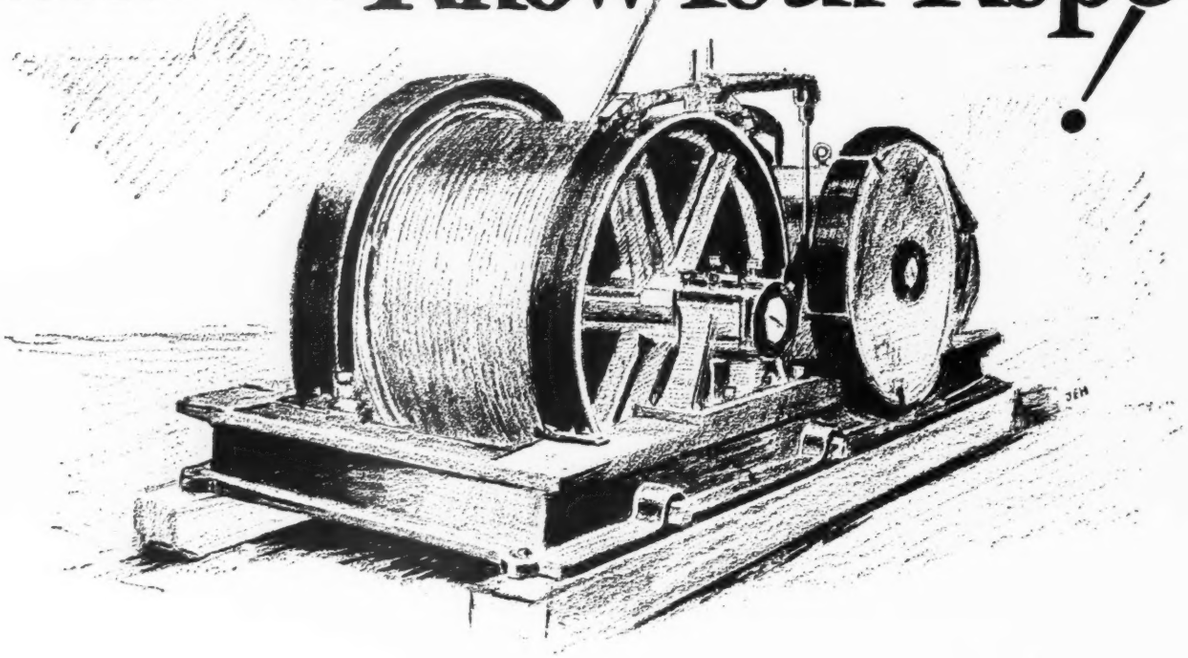
C-238

Chicago Pneumatic Tool Co.

Sales and Service Branches all over the World

6 East 44th Street, New York, N. Y.

It costs nothing—but it's worth much—to Know Your Rope!



GUESSWORK and uncertainty has been eliminated from the purchase of wire rope. Williamsport Wire Rope with the Telfax Tape shows the quality of the steel used in the rope. It's your protection of value and your identification of grade for all time.

Manufacturers who are thinking of their customers' protection use Williamsport Wire Rope. Careful buyers who want to be sure of the grade of rope they use, specify Williamsport —the rope with the tape denoting its tensile strength, its grade.—Others will continue to take chances until something happens.

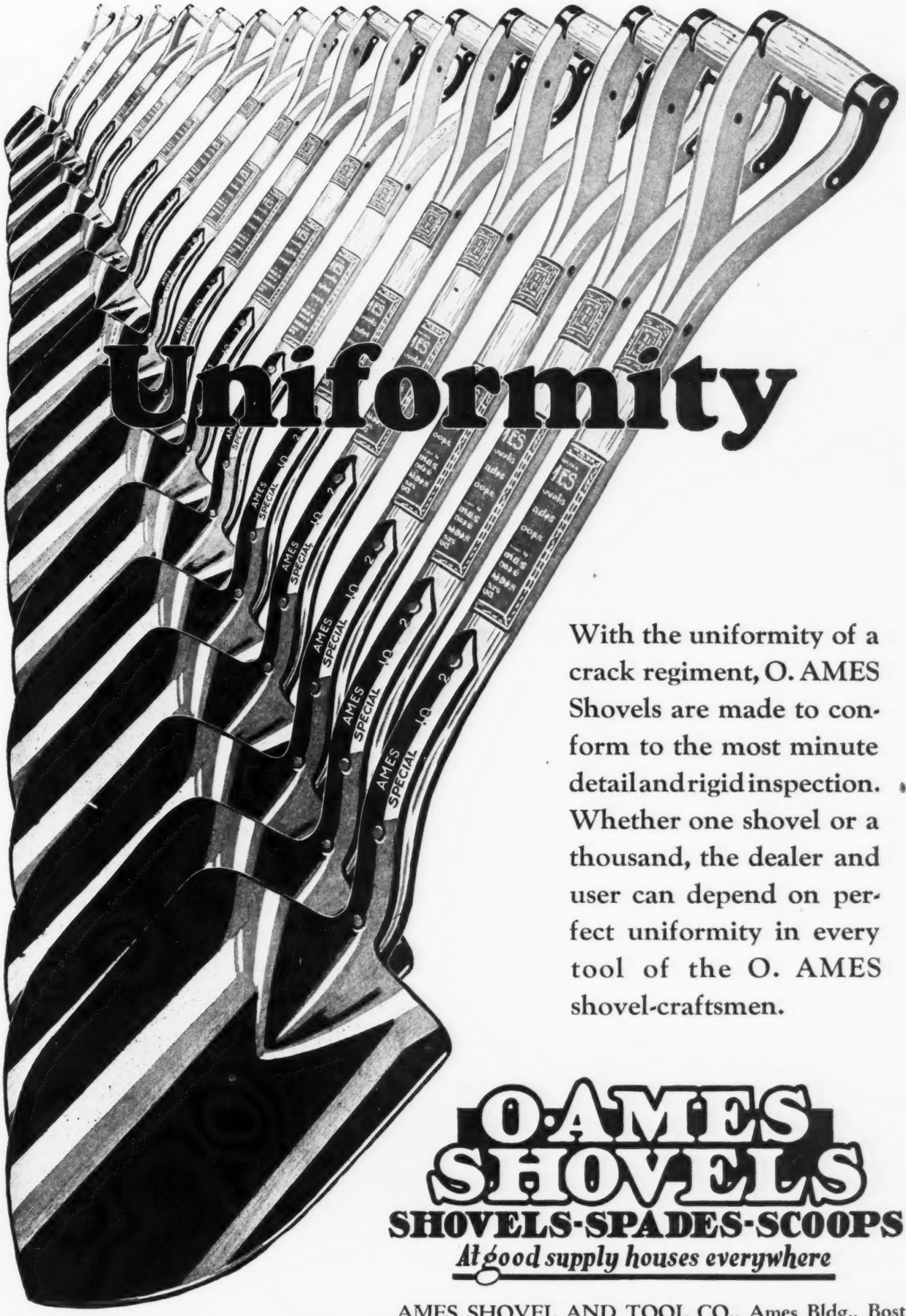
WILLIAMSPORT
is the only wire rope made, the grade of which is marked in plain English. You know what this rope will do, what kind of work it is best suited for—and this protection is worth more to you than the cost of the wire rope.

Insist on Williamsport.

WILLIAMSPORT WIRE ROPE COMPANY
Main Office and Works: WILLIAMSPORT, PA.
General Sales Office: Peoples Gas Bldg., CHICAGO, ILL.

WILLAMSPORT
CERTIFIED WIRE ROPE

Use Madesco Tackle Blocks—They Stand the Gaff



Uniformity

With the uniformity of a crack regiment, O. AMES Shovels are made to conform to the most minute detail and rigid inspection. Whether one shovel or a thousand, the dealer and user can depend on perfect uniformity in every tool of the O. AMES shovel-craftsmen.

O. AMES SHOVELS

SHOVELS-SPADES-SCOOPS

At good supply houses everywhere

AMES SHOVEL AND TOOL CO., Ames Bldg., Boston

Owner of Oliver Ames & Sons Corp., North Easton, Mass. Est. 1774

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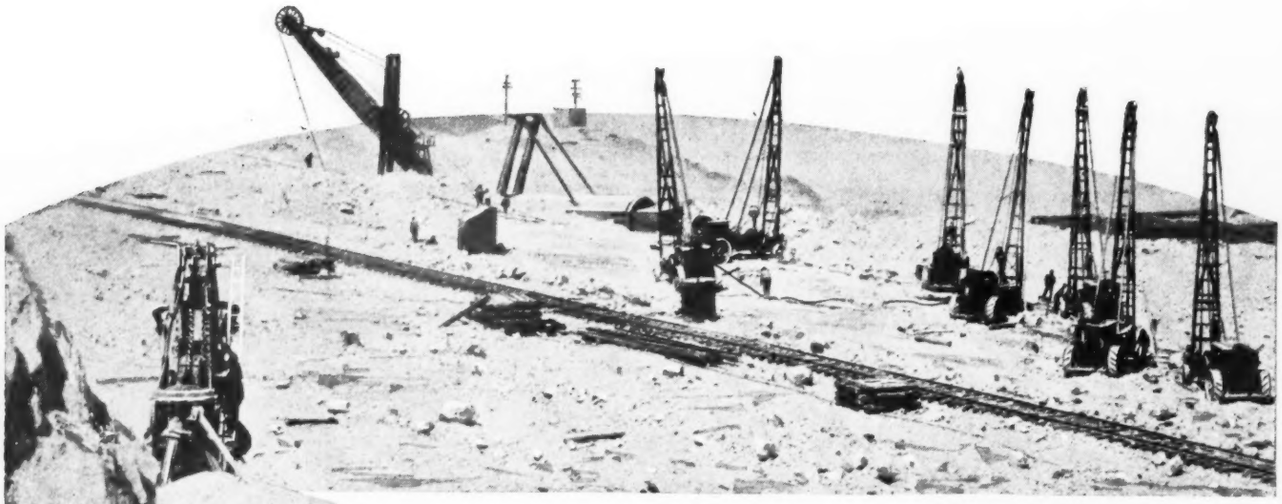


Built for Long Service out where the going is rough

Regardless how rough the work or where it may be, TIREX Cables assure an unfailing source of power for all electrical equipment.

It is in out-of-the-way places where the going is rough and where faulty equipment cannot be immediately replaced that TIREX is used and shows to best advantage.

At mine, mill, smelter and stripping operations, TIREX is dragged over ground strewn with jagged rocks, mud and water—yet, it gives long, uninterrupted service.

Rugged construction and the "selenium rubber" outer jacket —the toughest in the world—are the reasons why TIREX offers half again as much resistance to abrasion as any cable of similar type.

Selenium rubber was invented in our laboratory and is a patented TIREX feature.

A Few Simplex Products

TIREX Shovel Cable
TIREX Shot Fire Cable
TIREX Motor Lead Cable
TIREX Locomotive Reel Cable
Simplex Shaft Cable
Simplex Borehole Cable

SIMPLEX WIRE & CABLE Co

201 Devonshire St., Boston
New York Chicago San Francisco Cleveland Jacksonville

TRADE **TIREX** MARK

If it isn't SIMPLEX, it isn't TIREX

Capitalize your Investment in Mining Equipment

When you have a large investment in drilling, cutting, and hauling equipment, a general shut-down—even for only a few minutes—means lower production, with correspondingly higher costs. Why permit a fault in one section of your mine to stop operations in all the others? Automatic sectionalizing and reclosing equipment will confine the trouble to the affected section and restore it to service as soon as conditions permit.

Some of the advantages of this equipment are: 1. Increased profits through the prevention of general shut-downs. 2. Protection afforded to equipment constantly. 3. Valuable time saved, when, in an emergency, it becomes necessary to isolate a section of the distribution system. 4. Reduction of fire hazard as the equipment can be set at a lower tripping value than the sub-station breakers. 5. Prevention of repeated reclosing of the feeder on a short circuit.

This equipment is being applied daily to new tasks where certainty of performance is a requisite.

Automatic Switching Equipment

—part of the complete line of General Electric equipment to control and protect power generating and distributing apparatus.

461-8

GENERAL ELECTRIC

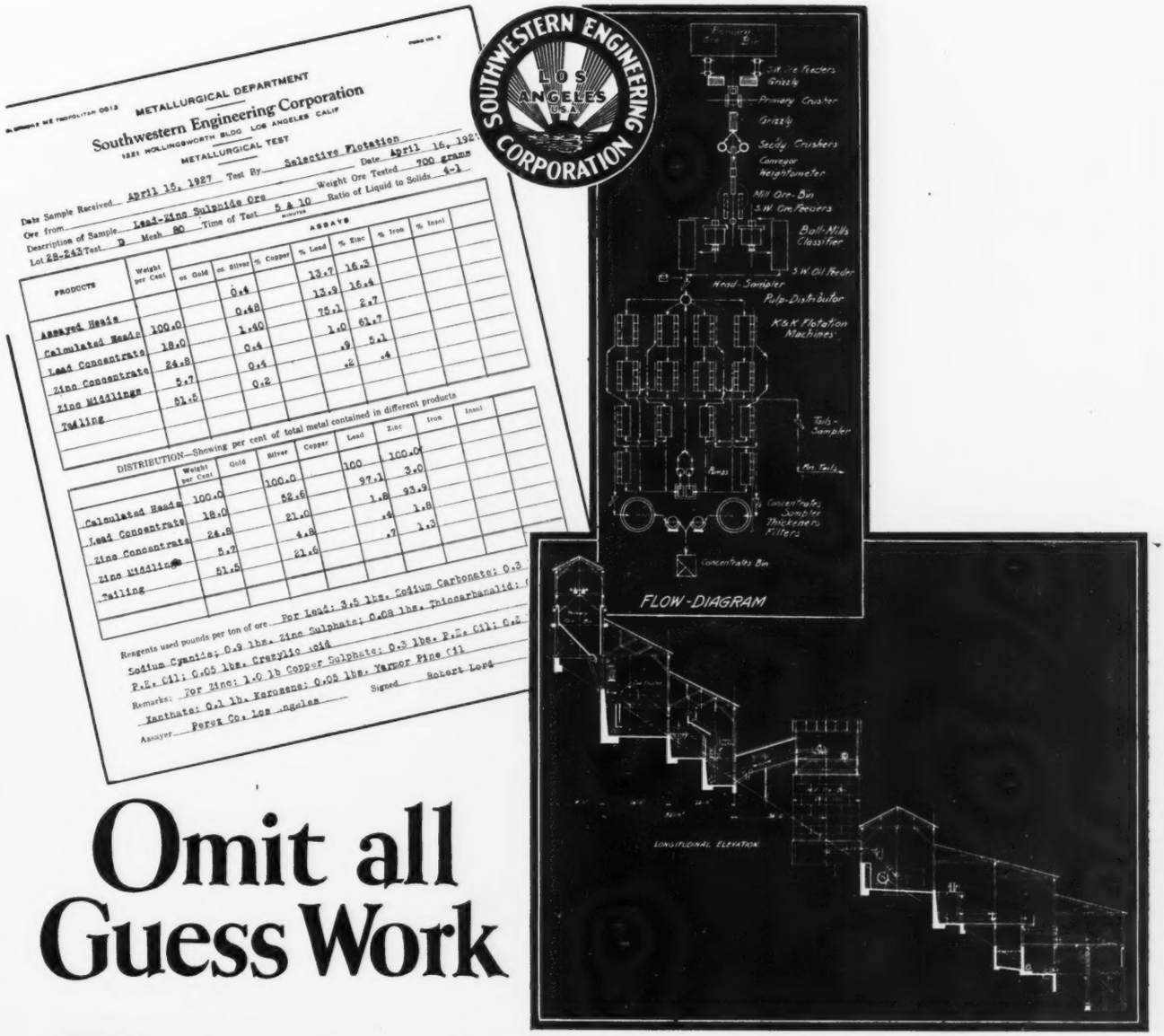
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

An Industrious Partner

With 22 years of experience to guarantee quality and with 31 plants and 101 warehouses to guarantee supply, Prest-O-Lite dissolved acetylene is an ideal partner in your business.

THE PREST-O-LITE COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
General Offices: Carbide and Carbon Building
30 East 42d St., New York
31 Plants—101 Warehouses

Prest-O-Lite
DISSOLVED ACETYLENE


METALLURGICAL DEPARTMENT
Southwestern Engineering Corporation
1221 HOLLINGSWORTH BLDG LOS ANGELES CALIF
METALLURGICAL TEST
Date Sample Received April 15, 1927 Test By Selective Flotation Date April 16, 1927
Ore from
Description of Sample Lead-Zinc Sulphide Ore Weight Ore Tested 700 grams
Lot 28-243 Test 9 Mesh 80 Time of Test 5 & 10 minutes Ratio of Liquid to Solids 4-1
PRODUCTS
Weight per Cent
ASSAYS
oz. Gold
oz. Silver
% Copper
% Lead
% Zinc
% Iron
% Insol
Assayed Heads
Calculated Heads 100.0 0.48 13.7 16.3
Lead Concentrate 18.0 0.48 13.9 16.4
Zinc Concentrate 24.8 1.40 75.1 2.7
Zinc Middlings 5.7 0.4 1.0 61.7
Tailing 51.5 0.4 .9 5.1
0.2 .6 .4
DISTRIBUTION—Showing per cent of total metal contained in different products
Calculated Heads 100.0 100.0 100 100.0
Lead Concentrate 18.0 52.6 97.1 3.0
Zinc Concentrate 24.8 21.0 1.8 93.9
Zinc Middlings 5.7 4.8 .8 1.8
Tailing 51.5 21.6 .7 1.3
Reagents used pounds per ton of ore For Lead: 3.6 lbs. Sodium Carbonate; 0.3
Sodium Cyanide; 0.9 lbs. Zinc Sulphate; 0.08 lbs. Thiocarbanilid;
P.E. Oil; 0.05 lbs. Cresylic acid
Remarks: For Zinc: 1.0 lb Copper Sulphate; 0.3 lbs. P.E. Oil; 0.2
Xanthate; 0.1 lb. Kerosene; 0.05 lbs. Yarmor Pine Oil
Assayer Perez Co. Los Angeles
Signed Robert Lord
SOUTHWESTERN ENGINEERING CORPORATION
LOS ANGELES U.S.A.
Primary Crusher
Grizzly
Secdy. Crushers
Conveyor
Weightometer
Mill Ore-Bin
S.W. Ore Feeders
Ball-Mills
Classifier
S.W. Oil Feeder
Head-Sampler
Pulp-Distributor
K.K.K. Flotation Machines
Tails-Sampler
Pumps
Concentrates Sampler
Thickeners
Filters
Concentrates Bin
FLOW-DIAGRAM
LONGITUDINAL ELEVATION

Omit all Guess Work

THE Southwestern Engineering Corporation has developed a 4-point Service available to the mining industry. This service makes successful milling a certainty. It tests ores; designs plants; furnishes the equipment and erects the plant; and turns it over, ready for operation. Plants designed and built under our methods will produce results as good or better than those submitted in our ore-test report, provided the ore samples are representative mill headings. We will undertake all or any part of this work.

The Southwestern Ore-Testing Department facilities include the usual laboratory scale testing equipment, a 2-ton per day gravity and flotation plant for confirmatory tests, and a 25-ton per day selective flotation and gravity plant capable of treating carload test shipments where such further confirmation is desired. In the past ten years, our metallurgical department has issued test reports on more than 2,000 different ores from all parts of the world.

Southwestern designing, metallurgical, and construction engineers are men of wide experience. They have been closely identified with the development of modern metallurgical practice in large and small plants, in laboratory and plant operation.

Prompt attention will be accorded all inquiries.

SOUTHWESTERN ENGINEERING CORP.

1221 HOLLINGSWORTH BLDG.

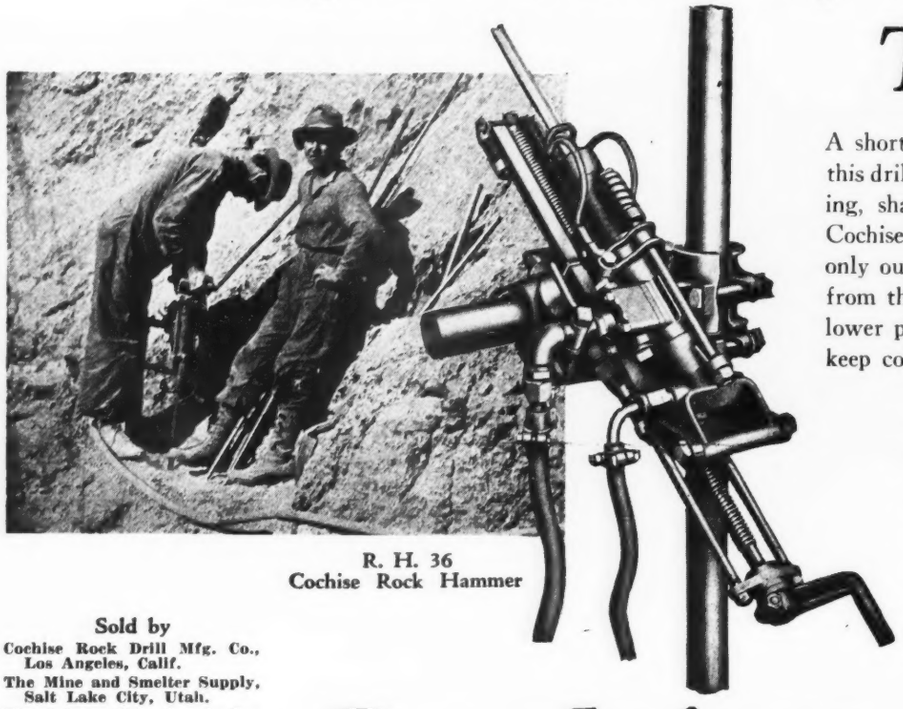
Los Angeles, Calif.

Branch
Joplin National Bank Bldg.
Joplin, Missouri

and
90 WEST STREET, NEW YORK CITY

Branches
Western Bldg., Amarillo, Tex.
Mayo Bldg., Tulsa, Okla.

Exceptional Drilling Capacity?



R. H. 36
Cochise Rock Hammer

Try it!

A short trial will show you what this drill can do. Whether quarrying, shaft sinking or mining this Cochise Rock Hammer will not only outdrill any competitive drill from the start but will also show lower power consumption and upkeep cost.

Manufactured in wet and dry types, unmounted or mounted. Make your next drill a Cochise. Write for further information.

Sold by
Cochise Rock Drill Mfg. Co., Los Angeles, Calif.
The Mine and Smelter Supply, Salt Lake City, Utah.
The Arizona Mine Supply Co., Prescott, Ariz.
A. H. Cox & Co., Inc., Seattle, Wash.

Sold by
Jules L. Vermeersch, Phoenix, Ariz.
Robertson & Moss, Johannesburg, South Africa
International Steel Co., Portland, Ore.
Rix Company, Inc., San Francisco and Los Angeles, Calif.

Cochise
ROCK DRILL MFG. CO., LOS ANGELES, CAL.

D. F. C. Oil Burners Save

Oil—Time—Power

A 50 per cent saving of fuel made possible when a D. F. C. Low Pressure Oil Burner was used on the Dwight Lloyd Sintering Machine caused the A. S. & R. Co. to standardize on D. F. C. Oil Burners wherever they used fuel oil.

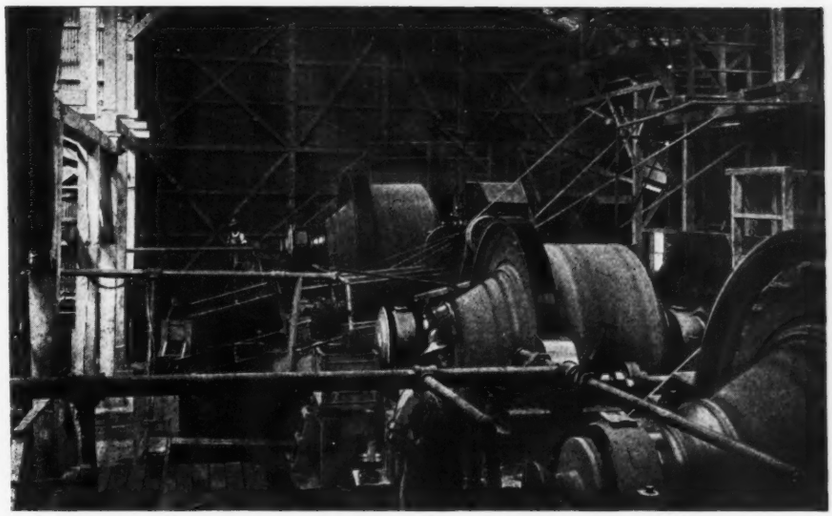
Two Number 1 D.F.C. Oil Burners are used on each unit of the Dwight-Lloyd Sintering Machine. These consume only 42 gallons of oil in 24 hours—one half the amount used previously.

Let our Engineering Department help you in the selection of the most efficient burner for your work. Send for Bulletin No. 301, containing valuable engineering data relative to the efficient use of fuel oil.

THE DENVER FIRE CLAY COMPANY

DENVER COLORADO

SALT LAKE CITY EL PASO NEW YORK CITY



100% More Grinding Capacity for 10% More Floor Space

The 10 ft. Hardinge Conical Ball Mill takes only 10% more floor space than the 8 ft. mill.

It has double the capacity of the 8 ft. mill, and is just as easy to operate.

One 10 ft. mill was ordered instead of two 8 ft. Hardinge Mills by the American Smelting and Refining Company for their Parral Unit in Mexico.

We have published a booklet of Operation Notes for Ball Mill users, which may give you some helpful suggestions. Write for a copy if you have none.

HARDINGE COMPANY
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WORKS AND MAIN OFFICE YORK, PENNA.
BRANCH OFFICES
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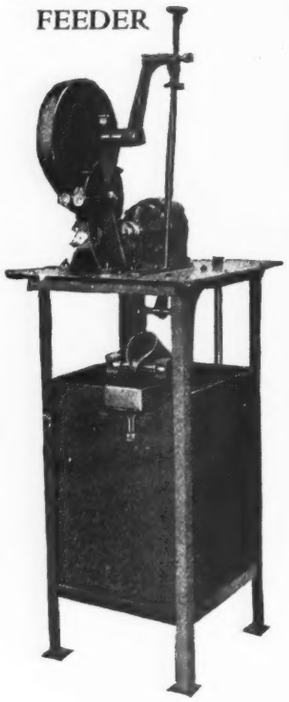
SALT LAKE CITY UTAH, CONTINENTAL BANK BLDG.
CABLE ADDRESS HARDINGE, NEW YORK

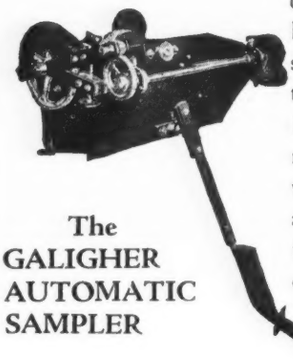
HARDINGE

Cuts Milling Costs

THE GEARY FEEDER



The Geary Feeder will feed accurately and efficiently any liquid reagent that will not attack iron. When once adjusted for the required feed it needs no further attention. By adopting this feeder you will be able to bring about a substantial reduction in your milling costs. You will find that this feeder is simple yet absolutely reliable under all operating conditions.



The GALIGHER AUTOMATIC SAMPLER

The annoyances and inaccuracies of irregular and haphazard methods of sampling can now be entirely eliminated by adopting the Galigher Automatic Sampler. This device is simple and accurate and its ability to successfully operate under all conditions has been conclusively proven by past performance.

We will gladly send additional information on request

The GALIGHER CO.

Successors to The Galigher Machinery Co.

Salt Lake City, Utah

The Smooth Highway

No surface conditions can block or hamper haulage where a B. & B. Aerial Tramway is installed. And there's nothing about the tramway itself to get out of gear. Structural and other material is of the toughest. Operation is simple as A. B. C.

Write us for names of mines, pit and quarry operators who are saving money with B. & B. aerial haulage. Ask also for Catalog 8.

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Eastern Office and Warehouse:
68 Washington St., New York.
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Manufacturers of the famous and powerful Yellow Strand and other good standard grades of wire rope.

J 501

B & B
Aerial Tramways

"C-M" Ideas

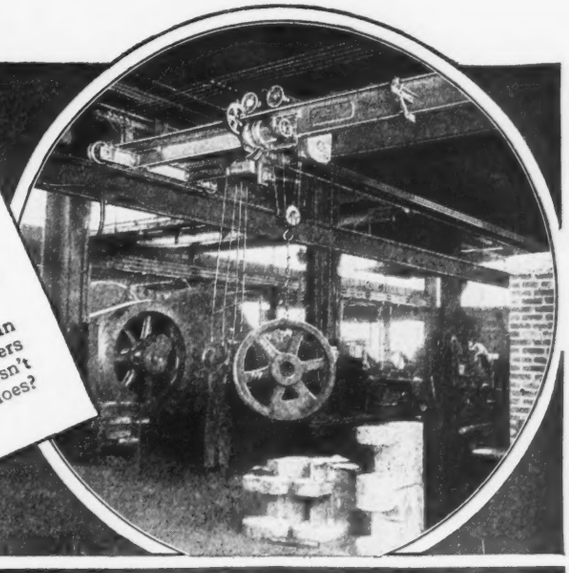
CHECK up on the concerns who have adopted "C-M" Ideas of material handling and you'll discover unmistakable signs of PROGRESSIVE MANAGEMENT.

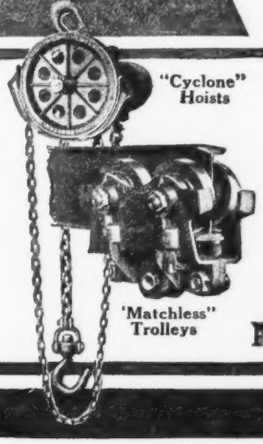
Illustrated on this page are typical examples of the practical and correct solution to problems of material handling. Your problems are different only in the sense that they require different combinations of "C-M" Overhead Material-Handling Equipment. "C-M" Ideas can determine the correct combination.

ABOVE is an example of a "C-M" Material-Handling Idea that has application to machine shops, foundries, warehouses, stock yards, and many other types of business. This complete "C-M" Overhead Track System includes two and three-way switches, "Matchless" Trolleys and "Cyclone" Hoists. It is so arranged that all materials may be handled direct from two receiving rooms; to and from every machine; and direct to two shipping rooms. *There's no lost motion in this plant!*

YOU'LL notice in the view at the right that *only one man* is handling material. The 5 ton "C-M" Electric Hoist submerged between the beams of a "C-M" Traveling Crane have made it possible for this man to lift and convey heavy castings with no more effort than is required to pull his cap down on his head.

Do you get the "C-M" Idea back of this? One man doing the work of from two to ten or more. The others released for productive work. If that doesn't answer the labor problem, what does?





"Cyclone" Hoists

'Matchless" Trolleys

CHISHOLM-MOORE

OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS

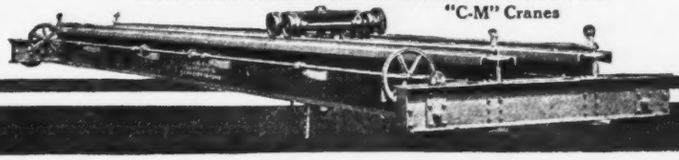
"C-M" Is the trademark of a complete line of Overhead Material-Handling Equipment, backed by an organization ably qualified to correctly apply that equipment to every material-handling condition. "C-M" Engineering Service is gratis. The "C-M" policy is based on "*Facts* to show *YOU* a way to *MORE PROFIT.*" Write for particulars.

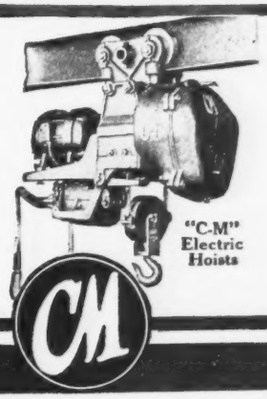
THE CHISHOLM-MOORE MFG. CO., Cleveland, Ohio

Branches: New York, Chicago, Pittsburgh

Representatives in All Territories for Immediate Service

"C-M" Cranes





"C-M" Electric Hoists

MASSCO

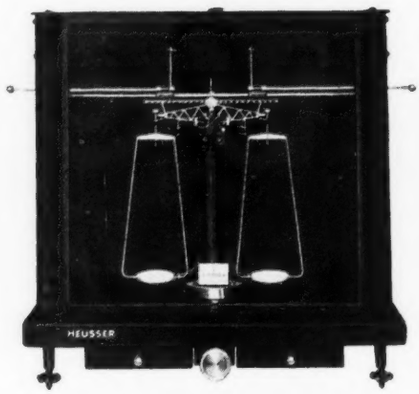
"Good enough" for particular work can apply only to a *highest* grade precision balance such as the Heusser, which can be depended upon for accurate determinations.

Lasting satisfaction with your purchase is another tangible asset that pays constant dividends. First-cost economy is out of place in selecting a fine balance.

Nothing in the way of normal usage will affect the perfect functioning and enduring adjustment of the Heusser. Its all-metal casing preserves the alignment indefinitely.

It is a masterpiece of a master craftsman.

The Heusser one-piece truss beam, patented edges and bearings, patented unit base and releasing mechanism, anti-friction rider apparatus and patented all-metal casing are standard on all regular models of Heusser Analytical and Assay Balances. Optional features are Multiple Weight Attachment, Mechanical Pan Extractor, Balance Illuminator and Magnifying Lens. All small metal parts are thoroughly gold plated. Twenty-nine models, sensitivity from 1/500 to 1/25 Mg., and a special model of 1/10 Mg.



Heusser Analytical Balance Group F. Truss beam 6¼ inches long, 50 divisions on each side. Approx. weight, 50 pounds; packed, 85 pounds. Price for 1/100 mg. sensitivity Group "F" as illustrated $160. Price for 1/100 mg. sensitivity Group "G" (with multiple weight attachment) $295.

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Fuller Industrial Paint Bulletins for Engineers are a valuable reference authority for your files. Representative subjects are: Metal Painting; Factory Pipe Lines; Waterproofing and Dampproofing Concrete; Wood Preservation, etc. These Bulletins are mailed on request to those interested.

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INDUSTRIAL Since 49 PAINT
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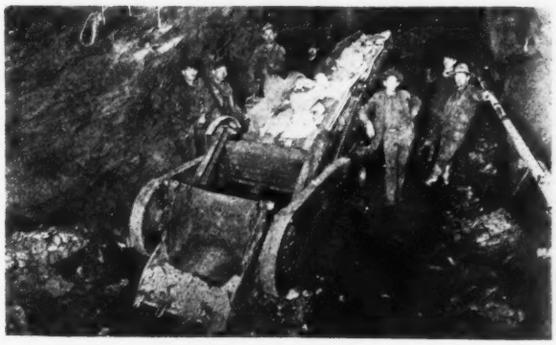
Shandaken-Hetch Hetchy-Cascade—

all "Myers-Whaley jobs"



Three times recently the world's record for speed in hard rock tunneling has been broken at the pioneer Cascade Tunnel of the Great Northern Railway, using Myers-Whaley Shovels.

Says the *Engineering News-Record:* "When the work on the tunnel started it was determined to try out various types of mucking machines and four different makes were selected and put to work at as many faces.

Myers-Whaley Shovels are now used at all the faces."

In all mine tunneling and drifting operations the quick removal of the broken rock speeds up all other operations, lowering all overhead costs and tonnage costs. Myers-Whaley Shovels give unequalled loading capacity, together with the stamina to stand up under this most severe service.

The Myers-Whaley Company have a great amount of loading data of interest to mine men. It will be furnished on request entirely without obligation.

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Knoxville, Tennessee

Myers Whaley
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Telephone your Armstrong order to your dealer

He can supply you from his shelves with an assortment of

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Genuine Armstrong stocks and dies, pipe cutters, pipe vises, nipple holders and pipe machines are backed by a record of more than 60 years of satisfaction to users. No other tools excel them in quality. They sell at a reasonable price and give you long, enduring service.

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Powerful, Trouble-proof Locomotives
for Heaviest Loads and Steepest Grades

INTENSIVE MINING Requires 365 Days a Year SERVICE.

American Mine Locomotives are designed by the same engineers and made by the same company that produces the world famous passenger and freight locomotives. The same reliability that is built into these "giants of the rail" is also to be found in their smaller commercial types. Where intensive mining has need of locomotives of ample power, "Americans" will meet the requirements.

Your engineers and our engineers should study your haulage problems together. This is the one sure way of obtaining the best locomotive equipment for your individual needs. Write or wire our nearest office today.

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AMERICAN LOCOMOTIVE

I heard a sturdy miner swear
Because he worked in rotten air.
He felt quite shaky in his bones
And therefore uttered shocking groans.
"Dear Boss," said I, "Buck up that man"
"And buy a real Coppus Fan"
"Which blows the air to any spot"
"Where it is sticky or too hot."
The boss, said "Yes, I'll try that out"
"Although I am still much in doubt."
The Coppus came—the Boss is happy
And all the men around feel snappy.

Coppus
Engineering Corporation
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Write for booklet on Mine Ventilation

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EMPIRE BUILDING—71 BROADWAY NEW YORK, N. Y.

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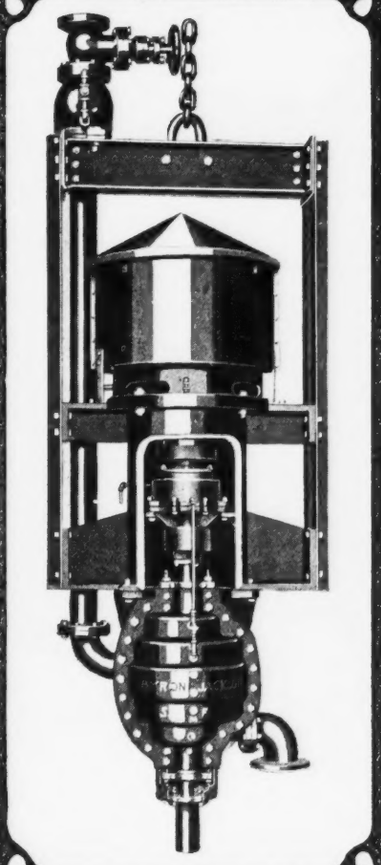

The most successful electric mine sinking and unwatering pump ever built. In addition to exceptional strength and rigidity of construction this super-pump embodies every up-to-date feature of design, such as case split on shaft center line, extra heavy thrust bearing and the well-known multiplex arrangement of impellers. Ask for special literature

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are embodied in this laboratory model of the Simpson Pneumatic Flotation Cell. Gives thorough agitation and aeration without any mechanical moving parts, this cell marks the greatest advance in differential flotation.

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Laboratory Model, Simpson Pneumatic Flotation Cell

Braun Laboratory Appliances Standard the world over!

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We also distribute Zinc Shavings, Cyanide Sodium Sulphide, Borax Glass and general laboratory equipment and chemicals.

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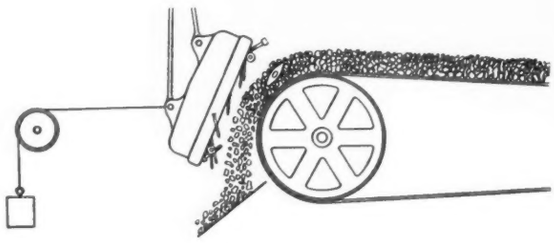

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EC&M Separator Magnets cost nothing to maintain as there is nothing to wear out. The current consumption is exceedingly small. Submit your separator problems to our engineers.

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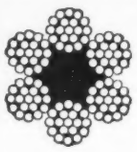

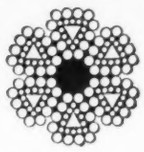

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Complete and Continuous

The success of the Laughlin Continuous Centrifuge in effectively and economically separating solids and liquids continuously is highly important to the mining industry. In mills, handling large quantities of flotation concentrates, ore residues, clays, sand slimes, crystalline and fibrous matter, etc., the complete recovery of solids from thickened mixtures will be reflected in greater earnings.

These machines are made in three types of any desired alloy to handle acid or alkali materials.

Laughlin Continuous Centrifuges are put in on a trial basis with an operating guarantee.

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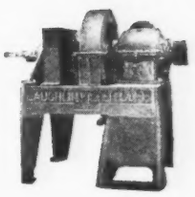
LAUGHLIN Continuous CENTRIFUGE



Models A and B

Adapted to any mixture where the solids are readily separated from the liquid by centrifugal force. No screens or cloth. For fine and mixed sizes.

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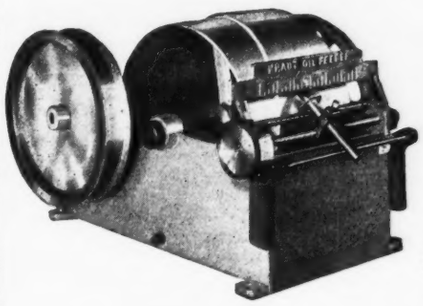
Adapted to any mixture of liquids and solids where a filter medium is necessary. The machine is suitable for such materials as are now handled in batch type centrifuges, and where drying and washing are desired in one operation, where sizes are ¼ m m and larger.

It is the answer!



KRAUT OIL FEEDER
(Patented)

Overall Dimensions 18 in. x 11½ in. x 10½ in.

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Flotation Machine
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The answer to a long-felt need for a compact, dependable Reagent Feeder, simple in design, simple in control of the feed from minute quantities to any desired amount. Ideal for use with preferential flotation.

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Metallurgical Engineering Division

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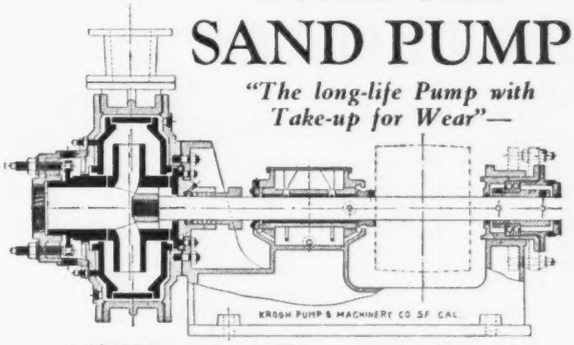
THE NEW KROGH SAND PUMP

"The long-life Pump with Take-up for Wear"—



All Wearing Parts are lined with Alloy Steel

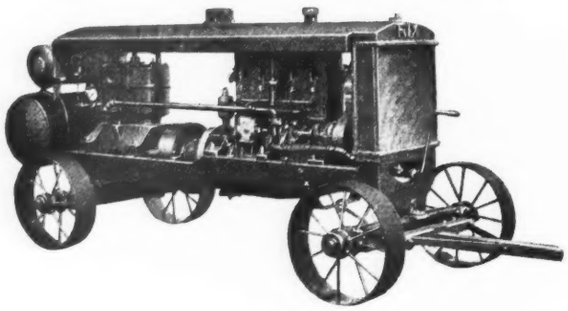
The life of the pump is lengthened.
The operation is made steadier.
Write for new Bulletin 98.

We continue to manufacture the old type Krogh open runner sand pump, so popular in the industry.

The Krogh Pump & Mach. Co.
147 Beale St., San Francisco

KROGH TRADE MARK

"Pumps Built for Endurance"



Dependable Performance

RIX PORTABLE AIR COMPRESSORS have gained a widespread reputation for dependable performance and long life service. You will find them used in mines and construction camps throughout the world, and in every case they are found to be the ultimate in efficiency.

Rix Compressors are direct drive machines. All are equipped with an automatic throttle for idling when compressor is unloaded. The cooling system should be especially noted. Its perfect design insures maximum results under the most severe working conditions.

The high degree of perfection of Rix Compressors is the outcome of years of labor and effort by one of the oldest firms in the Air Compressor Industry.

It will pay you to secure full information. We will be pleased to send you our new Bulletin P.C. 103.

The Rix Company, Inc.

400 Fourth Street **San Francisco**

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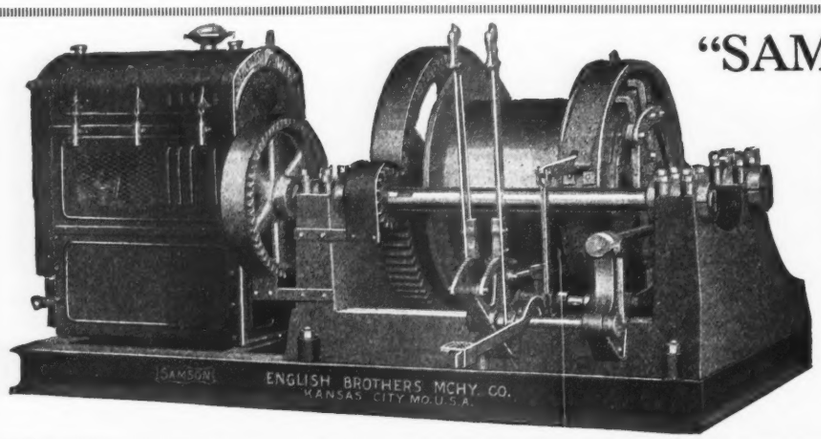

"SAMSON" Friction Drum Hoists

Low operating cost and low cost of upkeep account for the growing popularity of Hoists equipped with Electric or Gasoline Engine power.

Our "SAMSON" high grade Hoists equipped with multi-cylinder, high grade, Gasoline Engines are entirely dependable.

They are built in sizes with 8 hp., 2 Cylinder to 125 hp., 6 Cylinder Engines.

Upon request we will forward to you our bulletins illustrating and detailing these Hoists.

English Brothers Machinery Company
Manufacturers
Established 1880 Kansas City, Mo., U.S.A.

WILFLEY Centrifugal SAND PUMP
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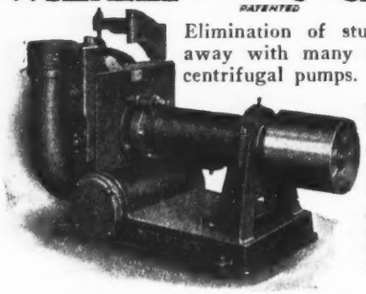

Elimination of stuffing box has done away with many troubles common to centrifugal pumps.

Pump maintains extraordinary efficiency.

Wearing parts unusually heavy, insuring long life.

Cleaning out pump or changing wearing parts requires only a few minutes.

Described and illustrated in our new Catalog

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A TYPE FOR EVERY SERVICE

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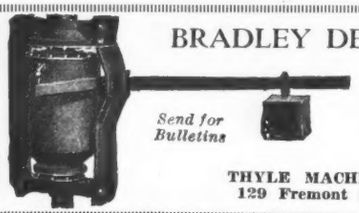

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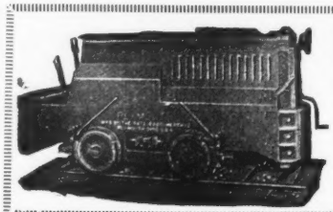
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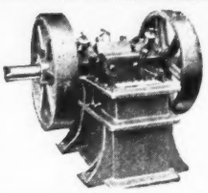
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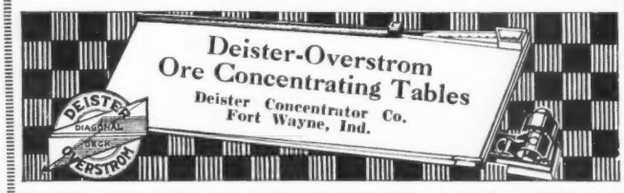

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4—7x12 (10-ton) 24-in. Gauge Davenport Saddle Tank Locomotives.
3—10x16 (18-ton) 36-in. gauge Davenport Saddle Tank Locomotives. (One at Spokane).
1—Jeffrey Trolley Locomotive. Draw bar pull 1,600 lbs. at 6 miles.
1—No. 5 Ingersoll-Rand Leyner Drill Sharpener.
2—Waugh Drill Sharpeners.
1—75x95-ft. Steel Building.
1—RH Sullivan Electric Diamond Drill.
14—Wilfley Tables—Various numbers.
50—Tons 3/16 and 7/32 in. steel sheets. Various sizes.
1—No. 3 Keystone Traction Well Driller.
48-in. Symons Vertical Disc Grinder with several tons of unused steel wearing parts, 300 hp. D.D. very sustantially built hoist, 150 kw. Generator and 54x20 Anaconda Type Rolls are almost new and must be sold without delay. Prices are accordingly.

For "close by" parties, complete mine plants (excepting small items only) for rent with privilege to purchase, rental to apply on purchase price. *See our next week's advertisement.*

BUTTE MACHINERY CO., Butte, Montana

(1)

A Few Items From Our Million Dollar Stock

HOISTS

1—Single Drum Electric Hoist, size of drum 20-in.x16-in. complete with 20 HP., G.E. Hoist Motor, controller and grids.
1—Deweo Single Drum Electric Hoist, size of drum 26-in.x16-in., complete with 20 HP. Westinghouse Hoist Motor, controller and grids.
1—Hendrie & Bolthoff Single Drum Hoist, size of drums 30-in.x16-in., complete with 22 HP. Westinghouse Motor, controller and grids.
1—Dillon-Box Single Drum Electric Hoist, size of Drum 20-in.x16-in., complete with G.E. 20 HP. Hoist Motor, controller and grids.
1—Dillon-Box Single Drum Electric Hoist, size of drum 30-in.x20-in., complete with Westinghouse 35 HP. Hoist motor, controller and grids.
1—Deweo Double Drum Electric Hoist, practically new, 5,000 pound rope pull at 400 ft. per minute complete with controller, grids and 75 HP. Westinghouse Hoist Motor.
1—Clyde Iron Works 3 drum Tandem Hoist, with slewing arrangement, complete with G.E., Type MTC, 80 HP. Hoist Motor, controller and resistance.

BALL MILLS

2—No. 32 Marcy Ball Mills, complete.
2—6-ft.x16-in. Hardinge Conical Ball Mills, complete.
1—5-ft.x12-ft. Deweo Ball Mill.
2—4½-ft.x20-ft. Deweo Pebble Mills, complete.
2—8-ft.x36-in. Hardinge Conical Ball Mills.

DORR EQUIPMENT

3—10-ft.x11-ft. Dorr Agitator Mechanisms, complete with redwood tanks.
2—16-ft.x16-ft. Dorr Agitator Mechanisms.
2—Dorr Duplex Classifiers, size 4-ft.6-in.x14-ft.-8-in.
2—Dorr Simplex Classifiers, size 2-ft.3-in.x14-ft.-8-in.
2—Dorr Duplex Classifiers, size 6-ft.x20-ft.
5—18-ft.x10-ft. Dorr Thickeners, complete with tanks.
2—30-ft.x9-ft. Dorr Thickeners, complete with tanks.
2—85-ft.x10-ft. Dorr Thickener Mechanisms, complete with steel superstructures.

"Service and Quality at a Saving in Cost."

Eastern Iron & Metal Company
634 South 4th West Street, Salt Lake City, Utah

MINE and MILL EQUIPMENT

THICKENER MECHANISMS

10—60-ft. Thickener Mechanisms, with tanks.
8—50-ft. Thickener Mechanisms, with tanks.
5—40-ft. Thickener Mechanisms, with tanks.
9—35-ft. Thickener Mechanisms, with tanks.
11—30-ft. Thickener Mechanisms, with tanks.
7—25-ft. Thickener Mechanisms, with tanks.
6—20-ft. Thickener Mechanisms, with tanks.
8—18-ft. Thickener Mechanisms, with tanks.
9—30-ft. Thickener Mechanisms, with tanks.
3—25-ft. Thickener Mechanisms, with tanks.
8—20-ft. Thickener Mechanisms, with tanks.
3—18-ft. Thickener Mechanisms, with tanks.
7—15-ft. Thickener Mechanisms, with tanks.
4—10-ft. Thickener Mechanisms, with tanks.
Will sell any of the above with or without wood or steel tanks.

AGITATORS

9—30-ft. Agitators mechanisms, with tanks.
3—25-ft. Agitators mechanisms, with tanks.
8—20-ft. Agitators mechanisms, with tanks.
3—18-ft. Agitators mechanisms, with tanks.
7—15-ft. Agitators mechanisms, with tanks.
4—10-ft. Agitators mechanisms, with tanks.
Will sell any of the above with or without wood or steel tanks.

AKINS CLASSIFIERS

8—54-in. Akins classifiers, 16-ft. long.
1—45-in. Akins classifier, 6-ft. long.

FILTERS

2—8-ft.x8-ft. Portland Continuous Filters.
1—14-ft.x14-ft.6-in. Portland Continuous Filter.

WILFLEY TABLES

1—No. 5 Wilfley Tables, deck 6-ft.x15-ft.11-in.

SCREENS

1—Type 33 Hummer Screen, 2 unit, 3 surface.
2—18-in.x72-in. Mitchell Vibratory Screens, type 2.
1—10-in.x60-in. Mitchell Vibratory Screens.
1—6-ft.x7-ft. Jeffrey Vibratory Screen.
8—4-ft.x14-ft. Dunlap Perfection Screens.
10—56-in.x16-ft. Dunlap Perfection Screens.

TRAMWAYS

1—7-mile Leschen Aerial Tramway.
1—5-mile Leschen Aerial Tramway.
1—3-mile Leschen Aerial Tramway.
1—5-mile Bleichert Aerial Tramway.
1—2-mile Bleichert Aerial Tramway.
1—1-mile Bleichert Aerial Tramway.
600—6½ cu.ft. Tram Buckets with grips and carriage.
Wide variety of equipment from which to fill your needs.

Morse Brothers M. & S. Co.
P. O. Box 1708, Denver, Colorado.

MINING AND MILLING
MACHINERY
DEPENDABLY REBUILT

BRAND NEW

We have recently acquired the following Ball Mill and Tube Mill which are brand new, and complete with their respective liners, Scoop Feeders, Bearings, etc.

1—4x3-ft. **Dewco Ball Mill** manufactured by Stearns-Roger Manufacturing Co.

2250 lbs. 2-in.—5-in. **Chrome Steel Ball Charge** for above.

1—3x6-ft. **Dewco Rod Mill** manufactured by Stearns-Roger Manufacturing Co.

4600 lb. 1½-in—2½-in. x 6-ft. **Rods** for same.

Send for full particulars. Priced right for quick sale.

SEND FOR CATALOGUE
ECONOMY-DEPENDABILITY-SERVICE
THE
DENVER
METAL & MACHINERY CO
ESTABLISHED 1898
DENVER COLORADO

MILLS & FILTERS

1—3-ft.x8-ft. Tube Mill.
1—4-ft.x16-ft. Tube Mill.
7—5½-ft.x22-ft. Tube Mills.
1—6x22 Tube Mill.
1—4½x16-ft. Hardinge Mill.
2—6-ft.x22-ft. Hardinge Mills
1—8-ft.x30-ft. Hardinge Mill
1—8-ft.x48-ft. Hardinge Mill
5—Oliver Filters, 6x4, 6x6, 6x8.

Also Marcy Mills, Sturtevant Ring Roll Mills, Hammer Mills, Jaw Crushers. Send for Complete List.

CONSOLIDATED PRODUCTS CO., INC., 15 PARK ROW, NEW YORK
Telephone: Barclay 0603

NEW AND RELAYING RAILS

Tie Plates
—Switches—Frogs
—Portable Track
Finest Quality
Flat Cars—Locomotives
Quick Delivery *Lowest Price*
HYMAN-MICHAELS CO.
People Gas Building
St. Louis CHICAGO San Francisco

2—8-ft., 2-6-ft. & 1-4½-ft. Hardinge Mills.
No. 10, No. 9, No. 8, No. 6 and No. 5 Gyratory Crushers.
6x60-ft., 6x70-ft., 6x100-ft., and 8x125-ft. Rotary Kilns.
30x42, 24x36, 18x36, 13x36, 12x24, 10x20 and 8x10 Jaw Crushers.
54x24, 30x16, 24x12, 16x10 Crushing Rolls.
3x30-ft., 4x30-ft., 5x40-ft., 6x60-ft., 8x80-ft. Rotary Dryers.
No. 0, No. 1, No. 1½ and No. 2 Sturtevant Rotary Fine Crushers.
14x14-ft., 6x6-ft., 5x6-ft. and 6x3-ft. Oliver Rotary Filters.
Jiggs, Concentrating Tables, Screens, Air Separators, Elevators, Ball and Tube Mills, Swing Hammer Mills.
1—500 kw., 3 ph., 60 cy., 440 v., Condensing Turbo Generator Set.
1—Triple Effect and two Double Effect Evaporators.
Heineken Engineering Corporation
95 Liberty Street, New York.

Diesel Engines

40 HP. to 500 HP.

500 hp. Busch with direct connected 60 cycle, 2,300 volt generator.
500 hp. Busch with direct connected 550 volt, D.C. generator.
(Units will be sold without generator if desired)
500 hp. McIntosh Seymour—can be arranged for direct connection or belt drive.
3—200 hp. De La Vergne (new still in original crates) arranged with long shaft for belt drive.
200 hp. Fairbanks Morse Type "Y" vertical 4 cylinder with direct connected 440 volt, 60 cycle, 3 phase alternator.
100 hp. Fairbanks Morse Type "Y" vertical two cylinder for belt drive.
40 hp. De La Vergne Type "DH".
Several other good engines.

Write us your requirements.

Robert P. Kehoe
Machinery Co.
7 East 42nd Street, New York

Watch—
the *Searchlight Section*
for
Equipment Opportunities
G-26

A Few Items from the Great KNAPP Stock

PUMPS
(Sand and Tailings)
1—2-in. Byron Jackson solid lined arranged for direct connection to motor.
1—2-in. Krogh solid lined arranged for direct connection to motor.
4—3-in. Wilfley belt drive.
2—6-in. Campbell & Kelly solid lined belt driven.

COMPRESSORS
1—Chicago NS02 Hot Head 309 cu.ft.
1—I. R. Simple Steam 7x8 compound air 10x7½x8: 140 cu.ft.
1—Rix Portable mounted on 1-ton truck 96 cu.ft.
1—Sullivan Portable 170 cu.ft.

GAS ENGINES
1—7 HP. Witte.
1—20 HP. Witte (new).
2—15 HP. Doak (new).
1—28 HP. Fairbanks-Morse Type "N."
1—45 HP. Doak.

BALL MILLS
1—2-ft.x4-ft. Joshua Hendey Prospector's ball mill.
2—4-ft.x3-ft. Hendey Ball Mills.

WATCH FOR NEXT WEEK'S ADVERTISEMENT OFFERING—

Blowers, Crushers and Driers. This is only a partial list of our stock. Write for complete new stock list just off the press. Get our low prices!

J. E. KNAPP CO.
525 Market Street, San Francisco, Calif.

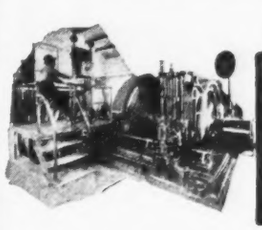
BOILER BARGAINS

2—187 hp. Stirling Water Tube, 150 lb. W.P., complete with fronts for stokers and single 54 in. x 125 ft. steel stack. Boilers used 6 weeks.
2—250 hp. Franklin Water Tube, 160 lb. W.P. standard fronts, single 60 in. x 100 ft. steel stack and regular catalog fittings.
If interested, write for complete specifications on above boilers, also for bulletins on complete stocks of mining, milling and saw mill equipment located at Salt Lake City and La Madera, New Mexico.

WESTERN MACHINERY COMPANY
260 South 6 West St., Salt Lake City, Utah

FOR SALE
Engines and Compressors
1—100 hp. F-M Type RE Engine.
2—50 hp. F-M Type Y Engines.
3—300 ft. Chicago Pneumatic Oil Engine Driven Compressors.
Reconditioned and Guaranteed
Also Steam Engines and Boilers, Pumps, Rock Crushers, Ball and Pebble Mills, Cars, Rails, etc.
Designers and Builders of Mining and Milling Plants, Used or New, and Guaranteed.
California Equipment Company
1426 Santa Fe Ave., Los Angeles, Cal.

THE TRAYLOR VIBRATOR CO.
1400 Delgany St. Denver Colo.
U. S. and Foreign Patents Issued and Pending



Once Used
Always Used
Repeat orders—this is the true test of long enduring hoist efficiency. Vulcan Hoists, used once, are always used.
VULCAN IRON WORKS
Wilkes-Barre, Pa.

VULCAN of WILKES-BARRE HOISTS

WHAT AND WHERE TO BUY

A Classified Index of Advertisers in this Issue

For Alphabetical Index See Last Page

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Engineering and Mining Journal* assumes no responsibility for errors or omissions.

Acetylene, Dissolved
Prest-O-Lite Co.

Acid, Sulphuric
Illinois Zinc Co.
Matthiessen & Hegeler Zinc Co.

Aerial Tramways
American Steel & Wire Co.
Broderick & Bascom Rope Co.

Aftercoolers, Air
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Agitators
Allis-Chalmers Mfg. Co.
Dorr Co., The

Amalgamators
Allis-Chalmers Mfg. Co.
Bunting Iron Works
Mine & Smelter Supply Co.

Analytical Apparatus
Denver Fire Clay Co.

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Amer. Smelting & Refining Co.
U. S. Smelting, Refining & Mining Co.

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Baker & Co., Inc.

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American Locomotive Co.

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Wiederholdt Construction Co.

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Denver Fire Clay Co.
Mine & Smelter Supply Co.

Balls for Ball Mills
Hardinge Co.

Barges, Steel
American Bridge Co.

Bars, Iron and Steel
Ryerson & Son, Inc., Jos. T.

Bars, Splice
Sweets Steel Co.

Bearings, Roller
Timken Roller Bearing Co.

Bearings, Tapered
Timken Roller Bearing Co.

Bearings, Thrust
Timken Roller Bearing Co.

Belting, Conveyor
Goodrich Rubber Co., B. F.
Stephens-Adamson Mfg. Co.

Belting, Elevator
Goodrich Rubber Co., B. F.

Belting, Transmission
Goodrich Rubber Co., B. F.

Blasting Supplies
Du Pont de Nemours & Co., E. I.

Blowing Engines
Nordberg Mfg. Co.

Blowers
Connersville Blower Co.
Coppus Engineering Corp.
General Electric Co.
Rix Co.
Roots Co., The P. H. & F. M.

Blowers, Centrifugal
Ingersoll-Rand Co.

Boiler Mountings
Lunkenheimer Co.

Boilers
Abendroth & Root Mfg. Co.

Boilers, Locomotive
American Locomotive Co.

Books, Technical
McGraw-Hill Book Co.

Boots and Shoes
Goodrich Rubber Co., B. F.

Bortz Core Drills
Diamond Drill Carbon Co.

Breaker Machinery
Vulcan Iron Works

Brick, Fire Clay
Denver Fire Clay Co.

Bridges, Steel
American Bridge Co.

Bridges, Suspension
Roebling's Sons Co., J. A.

Buckets, Elevator
Stephens-Adamson Mfg. Co.

Buckets, Gear
Wellman-Seaver-Morgan Co.

Buildings
Wiederholdt Construction Co.

Buildings, Steel
American Bridge Co.

Cables, Insulated, Telephone
Crucible Steel Co. of America

Cables, Wire
Williamsport Wire Rope Co.

Cableways
Roebling's Sons Co., J. A.

Cages, Hoisting
Atlas Car & Mfg. Co.

Carbon Core Drills
Diamond Drill Carbon Co.

Car Dumpers, Rotary
Wellman-Seaver-Morgan Co.

Car Hauls
Stephens-Adamson Mfg. Co.
Wellman-Seaver-Morgan Co.

Car Tipples
Wellman-Seaver-Morgan Co.

Cars, Gable Bottom
Atlas Car & Mfg. Co.
Watt Car & Wheel Co.

Cars, Hopper
Atlas Car & Mfg. Co.
Watt Car & Wheel Co.

Cars, Mine
Watt Car & Wheel Co.

Cars, Mine Roller Bearing
Ottumwa Iron Works

Cars, Ore
Atlas Car & Mfg. Co.
Watt Car & Wheel Co.

Cars, Quarry
Atlas Car & Mfg. Co.
Austin Mfg. Co.
Watt Car & Wheel Co.

Castings, Heat and Acid Resisting
Pacific Foundry Co.

Castings, Iron and Steel
Chrome Steel Works
Nuttall Co., R. D.
Pacific Foundry Co.
Vulcan Iron Works

Chains, Transmission
Stephens Adamson Mfg. Co.
Oliver Continuous Filter Co.

Chemical Apparatus
Braun Corporation
Braun-Knecht-Heimann Co.

Chemicals
Denver Fire Clay Co.

Chimneys
Wiederholt Construction Co.

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General Electric Co.

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Hardinge Co.

Classifiers
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Colorado Iron Works Co.
Deister Machine Co.
Dorr Co., The
Traylor Vibrator Co.

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Stephens-Adamson Mfg. Co.

Coal Cutters
Ingersoll-Rand Co.
Sullivan Machinery Co.

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Stephens-Adamson Mfg. Co.

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Lunkenheimer Co.

Compressors
Rix Co.

Compressors, Air
Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Nordberg Mfg. Co.
Oliver Continuous Filter Co.

Compressors, Air Portable
Ingersoll-Rand Co.
Sullivan Machinery Co.

Compressors, Gasoline
Sullivan Machinery Co.

Concentrators
Traylor Vibrator Co.

Concentrators, Table
Allis-Chalmers Mfg. Co.
Bunting Iron Works
Deister Concentrator Co.
Deister Machine Co.
Mine & Smelter Supply Co.
Straub Mfg. Co.

Condensers
Ingersoll-Rand Co.
Nordberg Mfg. Co.
Southwestern Engrg. Corp.

Controllers
Electric Controller & Mfg. Co.

Converters, Electric Rotary
General Electric Co.

Converters, Horizontal and Vertical
Allis-Chalmers Mfg. Co.

Conveying Systems
Chisholm-Moore Mfg. Co.

Conveyors and Elevators
Allis-Chalmers Mfg. Co.
Stephens-Adamson Mfg. Co.

Conveyors, Belt
Stephens-Adamson Mfg. Co.

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African Metals Corp.
American Metal Co.
American Smlg. & Refg. Co
Nichols Copper Co.
U. S. Smelting, Refining & Mining Co.

Copper Sulphate
Irvington S. & R. Co.
Nichols Copper Co.

Core Drill Diamonds
Diamond Drill Carbon Co.

Couplings, Air Hose
Cleveland Rock Drill Co.

Cranes
Chisholm-Moore Mfg. Co.

Cranes, Hand Power
Chisholm-Moore Mfg. Co.

Cranes, Traveling
Box Iron Works, Wm. A.
Chisholm-Moore Mfg. Co.

Creosote
Fuller & Co., W. P.

Crucibles
Bullard Co., E. D.
Denver Fire Clay Co.

Crushers
Allis-Chalmers Mfg. Co.
Austin Mfg. Co.
Box Iron Works, Wm. A.
Braun Corporation, The
Braun-Knecht-Heimann Co.
Colorado Iron Works Co.
Mine & Smelter Supply Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
United Iron Works, Inc.

Crushers, Coal
Vulcan Iron Works

Cupels
Denver Fire Clay Co.

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Consolidated Prod. Co.
Denver Metal & Mchry. Co.
Eastern Iron & Metal Co.
Heinecken Engrg. Co.
Knapp Co., J. E.
Machinery Sales Agency
Morse Bros. Machy. & Supply Co.
Roy & Titcomb, Inc.
United Commercial Co.
U. S. Machy. & Steel Co.
Western Machinery Co.

Dewaterers
Oliver Continuous Filter Co.
Thyle Machinery Co.

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Diamond Drill Carbon Co.

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Prest-O-Lite Co.

Dredges
Yuba Mfg. Co.

Dredges, Placer
New York Engineering Co.

Drilling, Core
Sullivan Machinery Co.

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Patrick, R. S.

Drills, Air and Steam
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Cochise Rock Drill Mfg. Co.
Ingersoll-Rand Co.
Rix Co.

Drills, Core
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Diamond
Sullivan Machinery Co.

Drills, Electric
Chicago Pneumatic Tool Co.
General Electric Co.
Ingersoll-Rand Co.

Drills, Hammer
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.
Cochise Rock Drill Mfg. Co.
Denver Rock Drill Mfg. Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Piston
Cochise Rock Drill Mfg. Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Prospecting
Ingersoll-Rand Co.
New York Engineering Co.
Sanderson-Cyclone Drill Co.
Sullivan Machinery Co.

Dryers, Coal
Vulcan Iron Works

Dryers, Ore
Allis-Chalmers Mfg. Co.

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Dust Recovering and Conveying Co.

Dust Protectors (See "Respirators")

Dynamite
Du Pont de Nemours & Co., E. I.

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American Bridge Co.

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Ohio Brass Co.

Elevators
Austin Mfg. Co.

Elevators, Bucket
Stephens-Adamson Mfg. Co.

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Dorr Co., The
Southwestern Engrg. Corp.
Stearns-Rogers Mfg. Co.

Engines, Diesel
Allis-Chalmers Mfg. Co.
Nordberg Mfg. Co.

Engines, Gas and Gasoline
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Thyle Machinery Co.
Wellman-Seaver-Morgan Co.

Engines, Hoisting
Ottumwa Iron Works

Engines, Oil
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Nordberg Mfg. Co.

Engines, Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Nordberg Mfg. Co.

Excavators, Dragline
Bucyrus Co.

Exhausters
Coppus Engineering Corp.

Explosives
Du Pont de Nemours & Co., E. I.

Explosives, Permissible
Du Pont de Nemours & Co., E. I.

Fans, Ventilating
Coppus Engineering Corp.
General Electric Co.
Ottumwa Iron Works
Vulcan Iron Works

Feeders, Ore
Bunting Iron Works
Colorado Iron Works Co.
Southwestern Eng'r'g Corp.
Stephens-Adamson Mfg. Co.

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Denver Fire Clay Co.

Filters
Colorado Iron Works Co.
Laughlin Filter Corp.
Oliver Continuous Filter Co.
Shriver & Co., T.

Filters, Cloth Metallic
Nat'l Filter Cloth & Weaving Co.
Oliver Continuous Filter Co.
United Filters Corp.

Filters, Concentrate
Laughlin Filter Corp.
Oliver Continuous Filter Co.
United Filters Corp.

Filters, Cyanide
Oliver Continuous Filter Co.
United Filters Corp.

Flood Lighting Projectors
General Electric Co.

Flotation Cell Bottoms, Cloth
Filter Fabrics Co.

Flotation Equipment
Galigher Co.

Flotation Machines
Bunting Iron Works
Southwestern Engrg. Corp.

Flotation Oils
General Naval Stores Co.

Flotation Reagents
Great Western Electro Chem. Co.

Flues
Wiederholdt Construction Co.

Forges, Rock Drill Steel
Ingersoll-Rand Co.
Sullivan Machinery Co.

Forgings, Steel
Chrome Steel Works

Furnace Facings and Linings
Denver Fire Clay Co.

Furnaces, Assay
Braun Corporation
Braun-Knecht-Heimann Co.
Denver Fire Clay Co.
Mine & Smelter Supply Co.

Furnaces, Bullion Melting
Mine & Smelter Supply Co.

Furnaces, Crucible Tilting & Refining
Mine & Smelter Supply Co.

Furnaces, Crucible, Tilting Metal
Denver Fire Clay Co.
Mine & Smelter Supply Co.

Furnaces, Electric
American Bridge Co.
Denver Fire Clay Co.
General Electric Co.

Furnaces, Heat Treatment
Denver Fire Clay Co.

Furnaces, Laboratory
Nichols Copper Co.
Pacific Foundry Co.

Furnaces, Mechanical Roasting
Allis-Chalmers Mfg. Co.
Colorado Iron Works Co.
Dwight & Lloyd Sintering
Mine & Smelter Supply Co.
Nichols Copper Co.
Pacific Foundry Co.

Furnaces, Melting
Braun Corporation, The
Braun-Knecht-Heimann Co.

Furnaces, Smelting
Allis-Chalmers Mfg. Co.
Combustion Engrg. Corp.
Denver Fire Clay Co.

Fuses, Electric
General Electric Co.

Gas, Dissolved
Prest-O-Lite Co.

Gas, Welding and Cutting
Prest-O-Lite Co.

Gaskets
Goodrich Rubber Co., B. F.

Gates, Traveling
Combustion Eng. Corp.

Gears
General Electric Co.
Nuttall Co., R. D.
Stephens-Adamson Mfg. Co.
Vulcan Iron Works

Generators, Electric
General Electric Co.

Glass Blowing
Denver Fire Clay Co.

Glass Ware Chemical
Denver Fire Clay Co.

Gravel Washing Plants
Stephens-Adamson Mfg. Co.

Grease Cups
Lunkenheimer Co.

Grinders, Air and Electric
Chicago Pneumatic Tool Co.

Grinders, Chemical Ore
Braun Corporation
Braun-Knecht-Heimann Co.
Cleveland Rock Drill Co.

Grinders, Ore
Hardinge Co.
Mine & Smelter Supply Co.
Williamson Co.

Grinders, Sample
Mine & Smelter Supply Co.

Hammers, Forging
Sullivan Machinery Co.

Hammers, Pneumatic
Cleveland Rock Drill Co.

Headlights, Incandescent Mine
Denver Equipment Co.
General Electric Co.
Ohio Brass Co.

Hoists, Air
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Hoists, Chain
Chisholm-Moore Mfg. Co.

Hoists, Electric
Allis-Chalmers Mfg. Co.
Chisholm-Moore Mfg. Co.
Nordberg Mfg. Co.
Ottumwa Iron Works
Rix Co.
Vulcan Iron Works
Wellman-Seaver-Morgan Co.

Hoists, Electric, Gasoline, Steam
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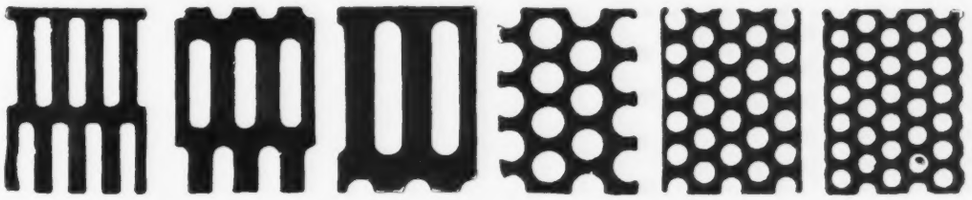

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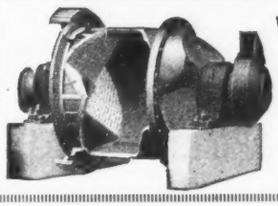

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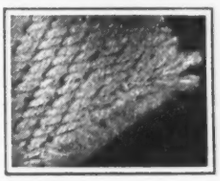

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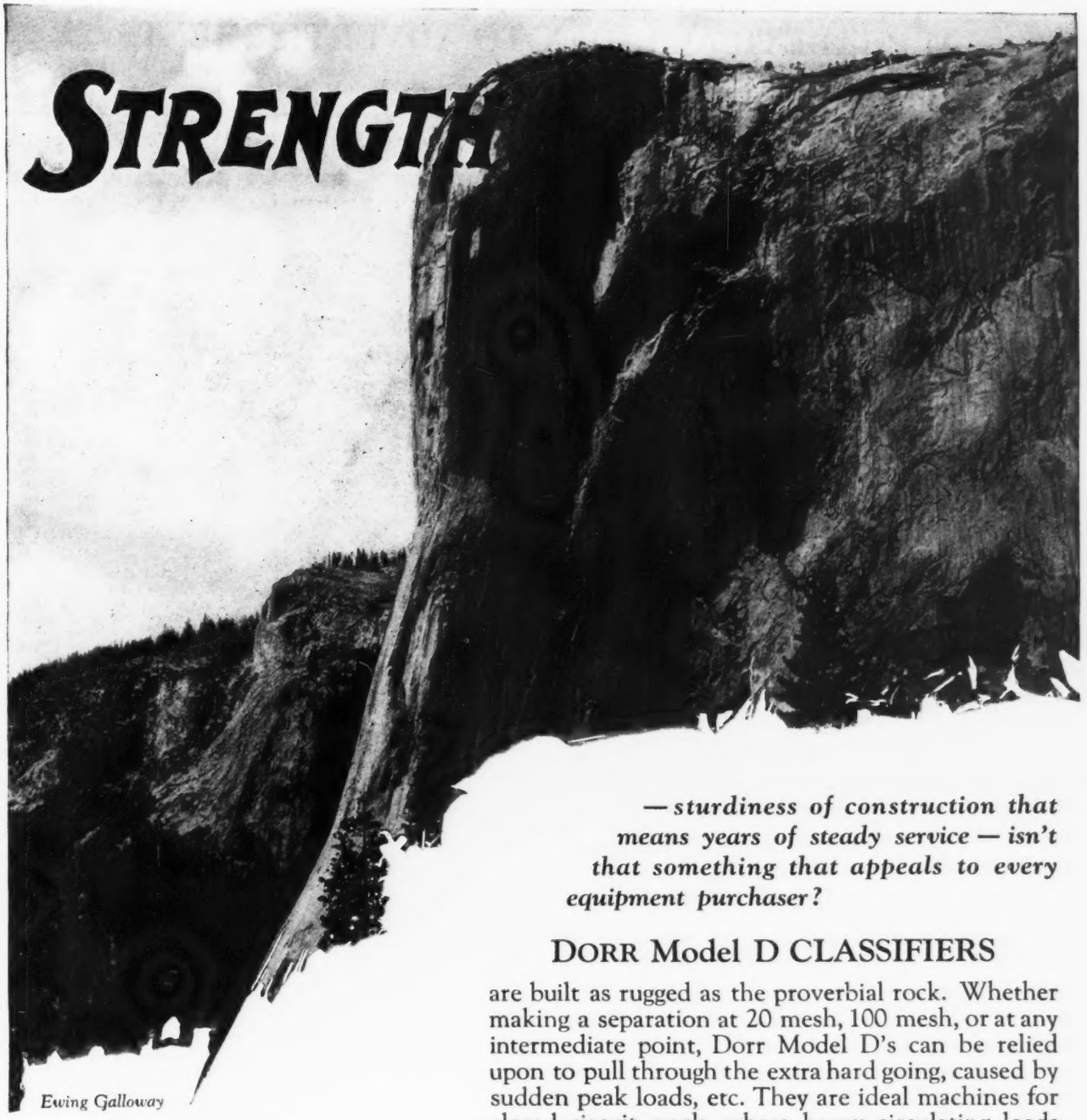

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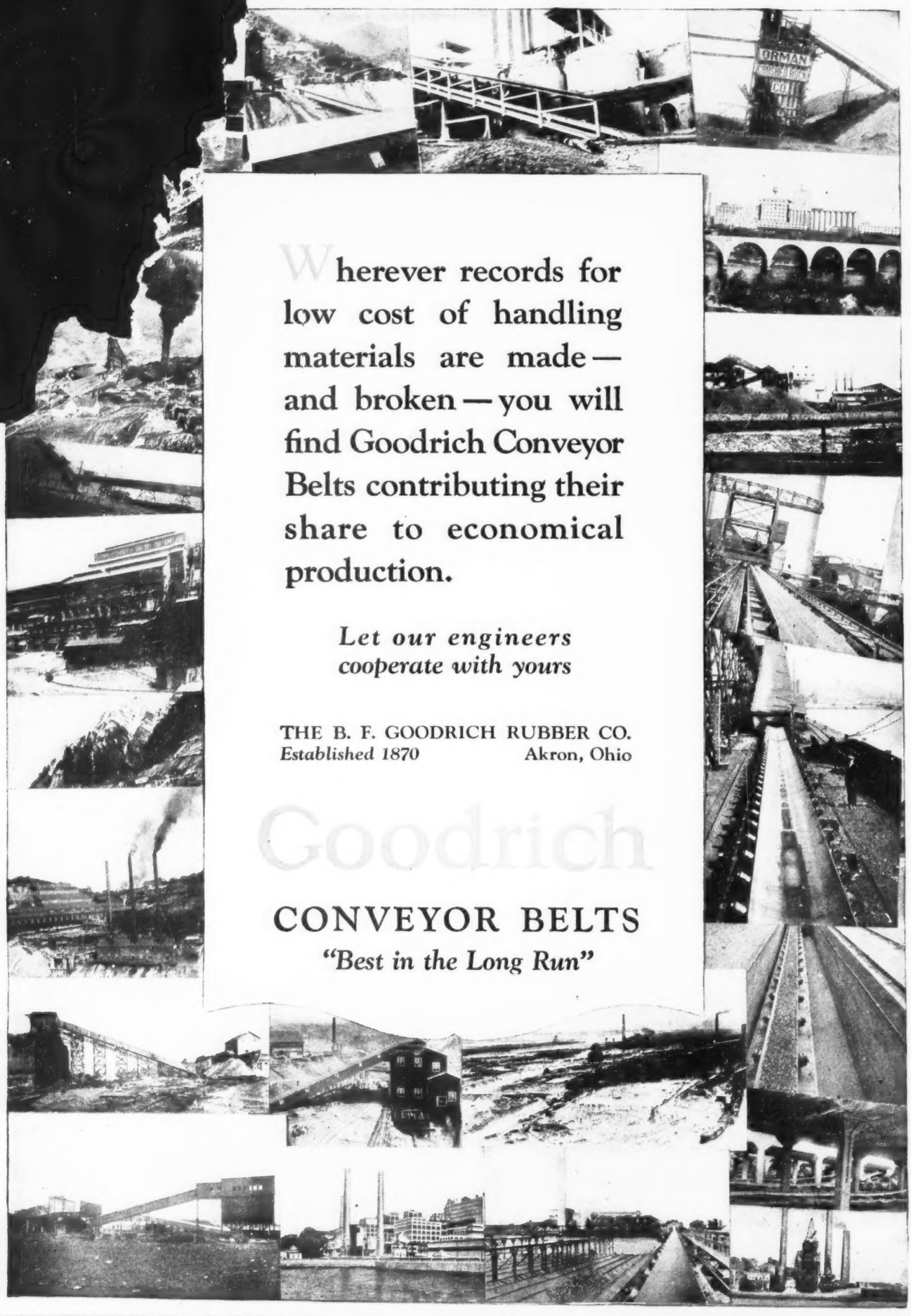

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